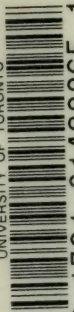


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# The Coal and Iron Industries


OF

## NOVA SCOTIA

BY

C. OCHILTREE MACDONALD

Member Historical Society of Nova Scotia.

*Author of* 

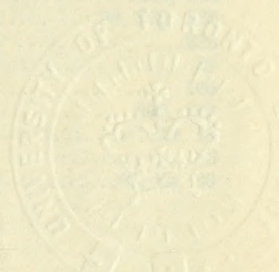
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ETC., ETC., ETC.



HALIFAX, N. S.,

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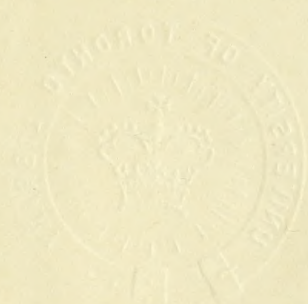
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## ERRATA.

The following errata have come under the Author's notice:

- Page 12, line 26, for Breton, read "United Empire Loyalist."  
Page 15, line 17, for party, read partly.  
Page 19, line 4, read a railway.  
Page 21, line 12, read and to create, and line 7, read, the Hub.  
Page 29, line 8, read "Odiorne."  
Page 44, line 13, read Glace Bay.  
Page 50, line 15, for cutters read putters, line 16, for 30 read 80.  
Page 54, line 21, shovels probably means, "mines," line 25, fortnightly, is apparently an error in the records.  
Page 59, line 19, family probably means "Relief Society," line 21—The error of \$100 in total taxes cannot be traced.  
Page 59, line 19, third, and fourth totals, errors in these figures, reproduced from Official Records cannot be traced, as they may be inherent in statistics added; this applies to any similar errors in the Official Records reproduced in this work.  
Page 66, read—Association and "Caledonia."  
Page 68, line 10, after picks, read; ..  
Page 74, line 20, for minor read miner, line 30 read, maliciously.  
Page 84, line 30, read, furnaces.  
Page 86, line 17, read shears.  
Page 91, lines 22 and 25, read Alumina and Manganese.  
Page 126, line 19, for Mimmac, read Micmac, line 13, for unlimately, read, ultimately.  
Page 127, line 17, read preserved.  
Page 166, Plate 29 and elsewhere, read "Nova Scotian Institute of Science."  
Page 180, line 15, for field, read fold.  
Page 191. Total Casualties, add 125 persons killed Cumberland (Springhill) coalfield, as stated in footnote, page 170. The error is due to an inaccuracy in the Mines Report.  
Page 198, omit, of , end of 9th line; lines 16 to 23—The Mines Department explains (Dec. 1909,) in respect of the Submarine Mining Schedule (which is not a Legislative ordinance for the Regulation of Submarine collieries) that Mine owners may remove, below the 180 foot cover line by pillar work, the balance of the bulk of the seams they open, e. g., the pillars are now being drawn, under the sea at about 600 feet cover in Cape Breton.  
Page 210, line 12, read the Nova Scotian Coalfields.  
Page 213, line 2, read the Nova Scotian collieries.  
Page 228, first footnote, line 3, read, towards the Antigonish ironfield.  
Page 229, line 4, read, virelibite.  
Page 232, line 9, read, bottom.  
Page 243, line 13, read, \*



## PARLIAMENTARY, PRESS AND OTHER COMMENTS UPON THE AUTHOR'S WORK IN NOVA SCOTIA.

Hon. W. S. Fielding, Premier of Nova Scotia, A. D., 1893: "Mr. Macdonald's connections have already enabled him to do good service to our Province."

In Halifax Chronicle: A.D., 1898: "Perhaps no man in this County (Cape Breton) holds better or sounder theories regarding the coalmeasures of Cape Breton."

Hon. Mr. Armstrong, in Legislative Council of Nova Scotia, A. D., 1903 drew the attention of that body to the Author as "the gentleman who had brought to the notice of the public the vast mineral resources lying under the sea."

Halifax Chronicle, A. D., 1904: "Mr. Macdonald deals with submarine coalmining as an expert and has thrown much light upon it."

A. Kendal, Member Legislative Assembly of Nova Scotia, to a public meeting in the Sydney Coalfield, A. D., 1906: Mr. Macdonald possessed the genius to see things which others did not see."

In St. John. N. B., "Star", A. D., 1906: "Mr. Macdonald has demonstrated that the Coalfields of Cape Breton extend far out under the ocean and has uncovered a source of wealth for the Province (of Nova Scotia.)"

Halifax Chronicle, A. D., 1906: "Nova Scotians are specially indebted to Mr. Ochiltree Macdonald, whose constant interest in the well-being of the Province and efforts to further its progress have been manifested in practical ways."

Halifax Chronicle, A. D., 1909: "Mr. Macdonald has been one of the pioneers in emphasizing the advantages of Nova Scotia and the Province is indebted to him for the effective way in which he has repeatedly brought its claims before the investing public at home and abroad. . . Mr. Macdonald has rendered admirable service to the Province. Let us follow up the good work along the path so well taken by Mr. Macdonald."

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By C. OCHILTREE MACDONALD

# The Coal and Iron Industries of Nova Scotia

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## CHAPTER I.

**A**LTHOUGH the Canadian coal trade has not yet expanded to the volume of that of the United States, the international importance of the Atlantic coalfields acquired from France, on the eve of the inauguration of steam navigation, has been fully demonstrated.

The Sydney coalfield, the most important of these fields, occupies about 32 x 6 miles of eastern Cape Breton, in the form of a parallelogram, bounded upon three sides by water communications with the most highly civilized nations in the world.

The marine margin of the field is indented by capacious ports; and the mine operators, assisted in one case by the State, have added the artificial harbors of Port Morien and Glace Bay to the trade outlets of the district.

The field is divided by spurs from the East Bay, Coxheath, and Boisdale Hills into the Cow Bay or Morien, the Glace Bay, Sydney Harbor and Bras d'Or Basins, in all of which coal mining is carried on; and it contains between its landward boundaries and the mechanical limit of submarine mining as at present understood, 9,000,000,000 tons of bituminous coal, exclusive of the seams thinner than three or four feet.

The sections of the coal measures at various points, according to the Geological Survey of Canada, are as follows:



NAMES OF THE COAL SEAMS.

[illegible]

Total thickness of coal in seams which may be workable . . . .







NAMES OF THE COAL SEAMS.

SYDNEY MINES.				BOULARDERIE.		CAPE DAUPHIN.	
SYDNEY HARBOUR.	Strata and Coal.	L. BRAS D'OR.	Strata and Coal.	West Side.	Strata and Coal.	MIDDLE.	Strata and Coal.
	Ft. In.		Ft. In.		Ft. In.		Ft. In.
Cranberry Head .....	3 8		8 1	Point Aconi.....	3 2		
Lloyd Cove .....	281 4	Lloyd Cove .....	231 7	Bonar .....	242 0		
Chapel Point .....	269 1	Seam B. ....	4 2	Stubbart .....	6 10		
Sydney Main .....	322 9	Sydney Main .....	380 7	Seam C. ....	218 9		
Willie Frazer .....	6 0	Bryant .....	3 0	Millpond .....	413 3	Seam D. ....	1 8
Indian Cove .....	315 10	Edwards .....	205 0	Blackrock .....	219 4	Four feet.....	237 0
Seam F. ....	117 0	(approx.) .....	78 0	Seam F. ....	176 5	Seam F. ....	4 0
Stony .....	87 0	Seam F. ....	5 5	Seam G. ....	125 8	Six feet .....	53 3
	123 9	Collins .....	2 9		43 9		54 0
	3 0		5 0		0 11		6 0
	30 4		30 5				
					28 9		13 5

The equivalency of the principal seams of the Cow Bay or Morien Basin, as observed by the writer, inserted below, differs from the above correlation by the Geological Survey of Canada.

SOUTH SIDE COW BAY BASIN.	NORTH SIDE Cow Bay Basin.	EQUIVALENT SOUTH SIDE GLACE BAY BASIN.
"Blockhouse" Seam.	"Blockhouse" Seam,	.....
"Gowrie" "	"Seam E" Can. Geo. Survey .....	.....
*"Spencer" "	"Eight Foot" Seam.	"Phalan"
†"South Head" "	"Six Foot" "	"Emery"

\*This seam reappears on the extreme eastern end of South Head.

†Part of this seam has been worked on South Head at the Wilson or Baird mine. It underlies the "Eight Foot" seam near Long Beach, Cow Bay.

The axes of the basins dip seaward (at Morien apparently at an inclination of about one foot in twenty feet); and it is computed that this arrangement of the strata adequately thickens the cover over the submarine coal. Owing to the excessive denudation to which the field has been subjected above sea level, the productiveness of the coal measures, so inclined, decreases rapidly inland; and the upper seams, which at present almost exclusively form the object of mining enterprise, run out close to the shore. This restricts the area of land mining in the principal seams of the Sydney Coalfield to the immediate vicinity of the coast; but the increasing demand for coal has already extended the collieries seaward into the adjoining submarine coalfield upon which the industrial future of Eastern Canada obviously must to a great degree depend. Mining being so exclusively restricted to the upper seams, no adequate commercial tests of many of the better preserved lower seams have been made; but, as the exigencies of the coal industry increase, they will be extensively drawn upon;

and their quality will doubtless sustain the reputation of Eastern Cape Breton, for fuel adapted to the purposes of modern civilization.

The Sydney Coalfield, like those in Inverness, Pictou and Cumberland, N. S., may be regarded as a detached portion of the Appalachian coalfield upon which the industrial supremacy of the United States is to so great a degree founded. Three hill ranges, their general features clearly showing them to belong to the Appalachian range diversify the surface of Nova Scotia; and a striking resemblance between the coalmeasures at Pittsburgh, U. S. A. and Glace Bay, Cape Breton, has been pointed out by the Director of the 2nd Geological Survey of Pennsylvania.

The strata enclosing the coal is mainly a coarse sandstone, separated from the seams by argillaceous shale; but sandstone occasionally rests upon the coal. Fortunately, however, for the submarine division of the field this permeable member of the carboniferous lies in impermeable argillo-arenaceous shales, etc., which constitute more than half the total thickness of the coal measures. These shales, when unconsolidated mud filled crevices in the underlying coal to which they had access, and so formed the curious rock masses, sometimes tapering from 3 to 36 feet at the roof to wedge shaped points near the pavement, in the "Block-house," seam at Morien.

The field is remarkably free from faults or other dislocations of the strata; as a rule the seams lie at easy angles; only moderate volumes of water and gas are encountered and the submarine coal is particularly dry.

The productive measures rest upon strata referred to, the Millstone Grit decreasing in thickness towards the N. W., which contains several seams of coal; the Grit is underlaid by the carboniferous limestone series, which contains, near South Bar, Sydney, a 2 foot bed of siliceous sandstone or quartzite, occasionally passing into a fair hematite ore, carrying over 30 per cent. metallic



iron. This ore has also been found profusely scattered over the the local surface; and similar rock, not, however, so rich in iron, has been found in place at the same geological horizon in another part of the field. The limestone rests upon the following descending formations. (The classification is by the Geological Survey of Canada):

1. The carboniferous, conglomerate series.
  2. Barrachois slates and other rocks of Cambrian age.
  3. George's River Limestone series.
  4. Syenitic, gneissoid and other felspathic rocks.
- } Pre  
Cam.

The industrial annals of this important district, which is obviously destined to become the site of some of the most important industries in the Western Hemisphere, indicate that the North American coal trade began at Morien (Cow Bay), A. D. 1720. Mines were later opened in the Glace Bay, the Sydney Mines and Bras d'Or districts. The builders of Louisburg drew their coal from the Morien mines, traces of which still exist in the old Blockhouse and Gowrie collieries, also from others, including the Sydney Mines seams; and after the first conquest of Cape Breton, in A. D. 1745, New England imported large quantities of coal from the Sydney field. This trade and the similar exports to Martinique by the French doubtless formed the nucleus of the home and foreign coal trade of North America.

The principal collieries, i. e., those at Morien, Table Head, Glace Bay, Lingan, and in the Sydney Mines district were operated under military protection. The Table Head mine was defended by a square palisaded and bastioned entrenchment, enclosing a Blockhouse massive enough to carry four-pound cannon, destroyed by a fire in the mine in A. D. 1752, and the Blockhouse colliery at Morien was guarded by a fort 100 feet square, enclos-

ing a Blockhouse, from which the name of the important seam wrought at that place has been derived. No efforts appear to have been made to create sheltered harbors. Shipping consequently waited in the more protected bays until fair loading weather prevailed, notably at the Table Head mine, probably the modern "Hub", where a pennon hoisted on a flagstaff signalled tonnage lying in Indian Bay to come and load.

After the conquest of Canada, Brigadier General Howe applied for a Crown Grant of 100,000 acres of land between Mira and Bras d'Or, containing the best part of the coalfield, and the following May (1764) Sir S. Fludyers applied for a Crown Lease of all the coal in Cape Breton, free of royalty for the first ten years, at 2s. 6d. sterling per chaldron of coal shipped during the second ten years; at 3s. 9d. per chaldron during the third ten years; and at 5s. od. per chaldron during the last ten years of the proposed lease. The Fludyers application was amended into a petition for a grant of 100,000 acres of land between Mira River and the Great Bras d'Or, inclusive of the contiguous coast, and a lease of the coal contained in it, on the basis of the settlement of 100 persons per five years, the erection of a town on one of the harbors, the payment of a quit rent of 2s. 1d. sterling per 100 acres of land after the lapse of ten years, a royalty of 2s. 6d. sterling per chaldron of coal exported during the first ten, and 5s. od. per chaldron during the succeeding 20 years of the proposed lease.

The British Trade Lords, at that time, anxious to reduce the price of coal in England by decreasing the Colonial demand for coal, recommended a lease to Howe and his associates, but the Imperial Ministry declined to grant it; and in 1765 a third projected Cape Breton Coal Company also failed to secure mining rights in the Sydney Field.

The influence of the British coal owners in Colonial affairs. in the 18th century, can doubtless be traced in this official discouragement of the Cape Breton coal industry, in the prohibition of new mines during the following year, the closing of the Blockhouse mine at Morien, and the illegalization of the Cape Breton coal trade in A. D. 1770. The financial necessities of the Nova Scotia Executive eventually modified this policy; and the Provincial Government, to raise funds for roadmaking, eventually sold for £500 to Gerrish and partners an exclusive right to mine 3,000 chaldrons of coal, half to be sold in the Halifax market, at not more than 32s. 6d. per chaldron. Gerrish and partners opened a mine on the north side of Sydney Harbor and exported:

To <i>quatre-vingt mille</i> 200,000 Chaldrons of coal.	
Halifax .....	1783
Louisburg .....	76
New England .....	143
Great Britain .....	217
<hr/>	
Total .....	2219

After which they applied for an extension of the lease, urging that they had been embarrassed by a subsidence in the mine, imports of English coal into Nova Scotia and by illegally mined Cape Breton coal in the New England market. This clandestine mining was perhaps a logical result of the prohibition of the Colonial coal industry, and it continued in spite of lawsuits in the Courts, armed patrols on land and cruisers on the sea, to the detriment of the legitimate coal trade.

After the intervention of France in the American rebellion a naval combat was fought off Sydney Harbor by the British ships Charlestown, 28 guns; Allegiance, 16 guns; Vulture, 16 guns; Little Jack, 6 guns; accompanied by the Vernon carrying some soldier-miners of the 70th Regiment, and the French frigates, L'Astree, 44 guns, and L'Hermione, 44 guns.



The British squadron, convoying sixteen colliers to Sydney Mines, had almost reached Sydney Harbor when the French overhauled it, and the Commander engaged them while the colliers escaped into the port. The combat was well sustained by both sides, but the "Little Jack" at length struck her flag and the French drew off with their prize, leaving the British commander and eighteen men dead, and 43 wounded, and the *Charlestown*, *Allegiance*, *Vulture* and *Vernon* obliged to refit at Halifax. The mines were at that time managed by the local military Commander, who sold all the coal raised beyond the requirements of the Nova Scotian Government, to local merchants and traders at 19s. 6d. per chaldron, for his own benefit; but after A. D. 1784 the price was reduced to 16s. od., and in A. D. 1788 to 13s. 6d. per chaldron, out of which the Governor received 5s. od. per chaldron as his perquisite.

From A. D. 1788 the revenue requirements gradually formulated the present policy of leasing the Cape Breton coal fields; and during the ensuing 40 years the King's coal mines were operated by:—

1788-1791—Thomas Moxley.

1792-1800—Tremain & Stout: Royalty, 5s. od. Halifax currency per chaldron.

1801-1804—William Campbell: Royalty 7s. od. per chaldron.

1804—State operated.

1813-1818—Lever & Ritchie.

1818-1820—G. W. Bown & J. Lever. (Mr. Bown came to Cape Breton as the Governor's Secretary.)

1820-1826—Messrs. Bown.

1827—General Mining Association.

Tremain & Stout also worked coal from the outcrop of seams as far north as Point Aconi, and similar operations were clandestinely carried on along the coast. Two small cruisers were put

into commission to check the latter, and, by an Order-in-Council, in A. D. 1795, all tonnage engaged in this illicit coal trade was declared liable to forfeiture. At the outbreak of the Franco-British war in A. D. 1793, Cape Breton was again exposed to the hostile fleets of a great power; and the lessees of Sydney Mines were alarmed by the arrival of a Cape Breton bound French 44 gun ship at Boston, a 10 gun French privateer at Tusket Harbor, and by the approach of a French squadron. Two large 2 gun boats were therefore stationed outside the bars of Sydney Harbor, and the Cape Breton militia patrolled the mines; but the danger passed away when the French were blown off the coast by a gale. That perilous year (A. D. 1793) marked the beginning of official interest in the coalfields which has developed into the Mines Department of Nova Scotia, and the regular application of the coal royalties to the public services. On February 5, A. D. 1800, Tremaine & Stout retired from Sydney Mines, and on November 17, A. D. 1801, the colliery was leased to William Campbell, Inspector of Mines, the maximum price of coal being then fixed by the Crown at 18s. od. per chaldron. This restriction in the price but not of the cost of production, helped to involve the new lessee in difficulties. His successors, Messrs. Lever & Ritchie, were succeeded in the year 1818 by (1) Messrs. Bown & Lever; (2) in 1820 by G. W. Bown; and (3) on August 30, A. D. 1822, by George William, Thomas Samuel, and William Richard Pown, of Sydney, members of a Cape Breton family, which has furnished members to His Majesty's Executive Council in Cape Breton. By their lease, Messrs. Bown acquired all the mines, pits and veins of coal then open or known, or that might be discovered at what was commonly called the King's Coal Mines, on Spanish River (Sydney Harbor); with the land and appurtenances connected therewith: containing 400 acres, more or less, excepting such parts of the surface and the buildings thereon as were occupied for military purposes. The market price of their coal was restricted to a

maximum of 23 shillings Nova Scotia currency per chaldron of 36 bushels; the royalty was fixed at 7s. 6d. N. S. currency per chaldron of the same measurement, raised or shipped, payable every two months; and they were obliged to annually raise all the coal consumers needed. Their business was, however, protected by a covenant that no other coal should be mined on the island of Cape Breton to their prejudice. Messrs. Bown enjoyed a monopoly of the Cape Breton coal trade until Dec. 31, 1826; the coal wrought at Bridgeport during their lease being mined only by their consent, on payment, it would appear, to them of a royalty of 5s. od. per chaldron. The output of their Sydney Mines Colliery was:

Year.	Winchester Chaldrons.	Royalty Paid.
1822 .....	5366	£2012. 5.0.
1823 .....	5295	1985.15.0.
1824 .....	7747	2905. 7.6.
1825 .....	7480	2805. 5.0.
1826 .....	8724	3271.13.1.

And their profits during the latter years of their monopoly averaged £3,000 sterling per annum.

Messrs. Bown were the most important of the early Cape Breton colliery owners, and their operations were subsequently noticed in complimentary terms in the State papers of Great Britain. They retired in A. D. 1826, on the transfer of an Imperial lease for 60 years, of the minerals of Nova Scotia—the Pictou and Sydney mines and some private grants excepted—from the Duke of York to the General Mining Association of London, England; and Sydney mines was acquired by the British Company under an agreement for a lease, which was not executed for a number of years:

The following table exhibits the recorded sales of Nova Scotian coal up to that time:



Year.	Tons.	Chaldrons
1761-1785.....		8137
1786.....	2,000.....	
1787-1792.....		9647
1793.....	1,926.....	
1794.....	4,405.....	
1795.....	5,320.....	
1796.....	5,249.....	
1797.....	6,039.....	
1798.....	5,948.....	
1799.....	8,947.....	
1800.....	8,401.....	
1801.....	5,755.....	
1802.....	7,769.....	
1803.....	6,601.....	
1804.....	5,976.....	
1805.....	10,130.....	
1806.....	4,938.....	
1807.....	5,119.....	
1808.....	6,616.....	
1809.....	8,919.....	
1810.....	8,609.....	
1811.....	8,516.....	
1812.....	9,570.....	
1813.....	9,744.....	
1814.....	9,866.....	
1815.....	9,336.....	
1816.....	8,619.....	
1817.....	6,284.....	
1818.....	7,920.....	
1819.....	8,692.....	
1820.....	9,930.....	
1821.....	11,308.....	
1822.....	7,512.....	
1823, 1824, 1825.....	27,000.....	
1826.....	12,600.....	

During most of this period the coal industry was but slightly supervised by the State, but about A. D. 1809 it was more intelligently conducted under the oversight of—

A Superintendent of Mines, at a salary of £100 per annum.

A Medical Officer of Mines at a salary of £150 per annum.

A Mines Revenue and Provincial Revenue Treasurer at a salary of £391 per annum.

A Government Agent of Mines at a salary of £225 per annum.

The last named official was allowed to supply the miners with food and other articles at a further personal profit of £225 per annum; and he perhaps founded, in Cape Breton, the Truck System of paying wages in merchandise, which was checked by legislation, promoted by the author, in 1895-7. During this period Sydney Mines was worked by an adit from the shore, or by shafts sunk to shorten the underground haulage. The miners were usually Irishmen, and their coal, hauled to the shaft bottom by manual labor, was raised in a six bushel tub to the bank-head by a double horse gin, and carted to the wharf or to the banking station near that structure. The working day was from 5 a.m. to 7 p.m. with one hour for breakfast and for dinner; the pay days were May 1st and Dec. 31st, and the wages were paid partly by the "Truck System"—a custom perpetuated by the General Mining Association.

The Mining Association invested its capital in Nova Scotia in the belief that the British coal export duty of 11s. od. per ton assured them a monopoly of the New England coal trade; and, stimulated by the repeal of the American tonnage dues on Colonial shipping and the opening of Sydney and Bridgeport to foreign vessels, shafts were sunk to the dip, the shipping facilities near Sydney Mines were improved, a colliery was opened at Bridgeport in 1829, and the profits of the company were sacrificed to obtain a position for Nova Scotian coal in New England. But, exports to the Northern States progressed so slowly that the Association drifted to the verge of ruin. Their difficulties were increased by the growing hostility of the Nova Scotia Legislature to their monopoly of the provincial minerals and their acquisition of the Pictou and Sydney Mines collieries by a second agreement

with the Imperial Government; but, on January 1st, 1858, the latter difficulties were removed by the surrender of the unpopular monopoly to the Provincial Government, in consideration of a reduction of the coal royalties and a lease to August 25, 1886, of the following tracts of coal:

(1) All the coal between a straight line from Stubbett's Point (Sydney Harbor) and the head of Mill Pond, Boularderie Island and the contiguous coast.

(2) All the coal between the coast and a straight line between McPhee's Ferry on the south side of Sydney Harbor and the mouth of the Northwest Brook, Bridgeport Basin.

(3) All the coal around the Bridgeport mine bounded north by the shore, westwardly by a line coinciding with the outcrop of the seam then open, southwardly by a line at right angles to the strike of the seam, distant not more than 160 rods S. W. from the last pit sunk thereon, and on the east by a straight line as parallel as possible with the west line and far enough therefrom to include two square miles.

(4) Four square miles of the Pictou and eight square miles of the Cumberland coal fields.

The company's business gradually improved, and by A. D. 1863 Sydney Mines was the centre of operations in 12 shafts, 7 levels and 3 Adits, in the "Main," "Lloyd Cove" and "No. 3" seams, at which 533 persons were employed.

The company ultimately restricted its operations in Cape Breton to the "Main seam" winnings, which passed under the Atlantic, at a vertical cover of about 690 feet in April, A. D. 1877.

The sales of coal at Sydney Mines up to A. D. 1900 were:



Table of Coal Raised, Sold and Exported at Sydney Mines, January, 1827-57

Year.	Raised and Sold Newcastle, Chaldrons, 53 cwt.		Exported to United States.		Exported to Neighboring Colonies.		Sold for Home Consumption.	
	Large.	Small.	Large.	Small.	Large.	Small.	Large.	Small.
1827	4297	.....	.....	.....	107	.....	4190	.....
8	5134	.....	524	.....	356	.....	4254	.....
9	4952	.....	1035	.....	655	.....	3262	.....
1830	5953	.....	2679	.....	397	.....	2877	.....
1	7463	.....	5315	.....	186	.....	1958	.....
2	9906	72	6330	4	1367	61	2209	7
3	7077	66	4886	46	611	.....	1582	20
4	5795	10	1893	.....	1165	.....	2737	10
5	7566	25	3207	.....	1442	14	2917	11
6	15380	89	9562	.....	2060	12	3758	77
7	16982	396	10184	199	3352	68	3446	129
8	13623	215	7078	141	2442	10	4103	64
9	21757	155	13047	60	4542	.....	4168	95
1840	18267	447	7983	192	4010	56	6274	199
1	23784	596	8790	278	5483	87	9511	231
2	24246	790	4731	338	10079	100	9436	325
3	23422	830	6561	223	7048	162	9813	454
4	22801	661	6220	100	7955	142	8626	419
5	24224	1658	8097	408	8811	388	7316	862
6	21437	1324	4548	340	7366	210	9523	774
7	26062	1734	8364	606	8024	307	9674	821
8	25149	1460	5714	314	8784	388	10651	758
9	24953	1529	6045	605	7128	248	11780	676
1850	24230	2018	5398	793	9009	487	9823	738
1	22905	1868	3854	1129	8306	158	10745	581
2	26387	1759	4336	929	10353	219	11698	611
3	25964	1614	3994	637	13250	266	8720	711
4	33278	2077	.....	.....	.....	.....	.....	.....
5	29382	2208	.....	.....	.....	.....	.....	.....
6	33849	2398	.....	.....	.....	.....	.....	.....
7	38368	3086	.....	.....	.....	.....	.....	.....

Year.	Sales, Tons.	Labor Employed Men and Boys.	Average Quantity Raised per day. Tons
1858	100,667	.....	.....
9	109,580	.....	.....
1860	117,600	.....	.....
1	100,400	.....	.....
2	111,600	.....	.....
3	104,373	.....	.....
4	55,656	.....	.....
5	99,424	.....	.....
6	118,857	.....	.....
7	100,043	.....	.....
8	131,084	.....	.....
9	95,700	.....	.....
1870	108,900	.....	.....
1	105,494	460	578
2	102,691	470	542
3	103,123	521	496
4	72,552	595	421
5	92,829	640	500
6	70,636	516	473
7	88,087	508	443
8	106,356	527	540
9	108,259	561	526
1880	115,307	538	618
1	133,135	569	600
2	133,623	586	612
3	131,673	570	655
4	131,393	517	913
5	103,917	515	664
6	119,949	522	723
7	145,210	563	708
8	126,896	566	617
9	123,902	589	674
1890	150,468	609	678
1	146,645	605	691
2	164,078	.....	.....
3	147,913	643	863
4	220,082	657	906
5	221,896	681	915
6	228,099	691	980
7	229,849	750	982
8	243,638	827	949
9	245,887	826	958

The company opened and abandoned the following collieries during this long period :

(1) ("BRIDGEPORT COLLIERY.")—In the Phalan seam, connected by railway across the bar, with a shallow port on the north side of Indian Bay.

The production and sales at this mine were :—

Year.	Production in Newcastle, Chaldrons, 53 cwt.		Exported to United States.		Exported to Neighboring Colonies.		Sold for Home Consumption.	
	Large.	Small.	Large	Small.	Large.	Small.	Large.	Small.
1829	579	.....	.....	.....	.....	.....	579	.....
1830	1531	.....	86	.....	33	.....	1412	.....
1	1725	6	408	.....	160	.....	1157	.....
2	5448	6	1818	.....	601	.....	3029	.....
3	4814	.....	702	.....	868	6	3244	.....
4	3563	.....	967	6	552	.....	2044	.....
5	4128	30	815	29	808	.....	2505	1
6	6094	92	2326	83	1063	.....	2705	9
7	6279	224	2799	145	1294	79	2186	.....
8	6233	241	2170	202	1204	33	2859	6
9	6009	378	2720	337	660	.....	2629	41
1840	4324	133	1790	122	415	.....	2119	11
1	2042	233	1258	190	170	15	614	28
2	.....	45	.....	.....	.....	.....	.....	45
3	.....	53	.....	.....	.....	.....	.....	53
4	.....	81	.....	.....	.....	.....	.....	81
5	841	48	543	39	.....	.....	271	9
6	75	59	.....	.....	.....	.....	75	59
7	68	64	.....	.....	.....	.....	68	64
8	41	46	.....	.....	.....	.....	41	46
9	7	9	.....	.....	.....	.....	7	9

(2) ("LINGAN COLLIERY.")—Opened in the Lingan "Main" seam in A. D. 1854, connected by rail with Lingan Harbor and extended under the sea. The coal sold up to the cessation of operations in A. D. 1886 was :—



Year.	Tons.	Chaldrons.	Bushels.	Year.	Tons.	Chaldrons.	Bushels.
1854	.....	119	30	1871	21,940	.....	.....
5	.....	1,798	33	2	38,504	.....	.....
6	.....	3,274	48	3	26,067	.....	.....
7	.....	3,528	41	4	13,253	.....	.....
8	4,942	.....	.....	5	25,673	.....	.....
9	9,240	.....	.....	6	16,533	.....	.....
1860	16,298	.....	.....	7	19,130	.....	.....
1	35,301	.....	.....	8	11,527	.....	.....
2	34,204	.....	.....	9	10,220	.....	.....
3	36,059	.....	.....	1880	27,897	.....	.....
4	34,427	.....	.....	1	32,376	.....	.....
5	57,160	.....	.....	2	64	.....	.....
6	48,257	.....	.....	3	12,918	.....	.....
7	45,696	.....	.....	4	20,871	.....	.....
8	22,573	.....	.....	5	18,867	Operated by Low Pt. Bara- sois Mining Co.	.....
9	30,378	.....	.....	6	15,058		.....
1870	27,744	.....	.....				.....

(3) "THE BARRASOIS COLLIERY."—In an overlying Seam, about two miles westward, opened to establish the Association's title to five square miles of the submarine coal field adjoining the Lingan property, and closed after a little coal had been mined.

(4) "THE LITTLE BRAS D'OR COLLIERY."—Opened in A. D. 1832, in a seam said to average 5 feet of coal, about four miles inside the entrance of the Little Bras d'Or and abandoned after about four years operations during which about 9,000 tons of coal were raised.

On the readjustment of the Mining Association's properties at the surrender of their monopoly, this mine was left outside of their new boundaries, and it became in the following year the object of mining enterprise as the "Collins' mine."

The "Lloyd" and "Indian Cove" seams, once wrought by the French and British pioneers for the Louisburg and Halifax markets; and the "Stubbert" seam, were also worked by the Association on a small scale.

## CHAPTER II.

The extinction of the General Mining Association's monopoly promoted the more general development of the Sydney coalfield; and the new collieries received an impetus from the existing Reciprocity Treaty with the United States, admitting Nova Scotian coal to the New England market duty free.

In A. D. 1858, E. P. Archibold, of Sydney, and J. A. Moren, of Halifax, drove a slope in the "Hub" seam at Glace Bay and loaded colliers up to 100 tons burden at Shag Roost; and in 1862 they induced H. B. Paulin, Peter Lynch and J. R. Lithgow, of Halifax, and W. B. Parrott, James W. Emery, Estes Howe, J. H. Converse and Gardner G. Hubbard, of New England, to join them in the Glace Bay Mining Company, to create a harbor out of a neighboring pond, which communicated with the Atlantic. Legislative power was obtained to improve both Little and Big Glace Bays and Lakes, subject to the right of the public to use the proposed harbors for all purposes except the shipment of coal, at rates to be fixed by the Governor-in-Council; and in a short time colliers were loading in Little Glace Bay Harbor.

The "Hub seam", 9 feet 4 inches thick was more systematically opened by a stone drift and by shafts; but in A. D. 1874 mining operations were concentrated at the Stirling, or Little Glace Bay mine, in the underlying Harbor seam, 5 feet 0 inches thick.

The following table exhibits the sales of coal from both seams up to A. D. 1892 :—

Year.	Sales, Tons.	Labor Employed Men and Boys.	Average Quantity Raised per day. Tons.
1858	469	.....	.....
9	2,373	.....	.....
1860	2,297	.....	.....
1	5,540	.....	.....
2	7,730	.....	.....
3	26,700	.....	.....
4	72,000	.....	.....
5	58,178	.....	.....
6	57,900	.....	.....
7	52,026	.....	.....
8	64,217	.....	.....
9	20,020	.....	.....
1870	55,681	.....	.....
1	39,500	140	236
2	30,700	111	204
3	66,437	220	238
4	40,988	215	295
5	25,797	111	118
6	28,962	127	124
7	35,373	160	199
8	20,429	98	123
9	23,279	92	121
1880	26,440	85	138
1	31,611	92	182
2	69,049	180	326
3	72,677	208	395
4	32,753	160	228
5	40,989	143	285
6	29,123	126	236
7	75,642	176	425
8	77,406	215	760
9	73,919	223	436
1890	108,490	258	518
1	110,212	325	518
2	93,690	.....	.....



The following are reminiscences of the conditions under which the Little Glace Bay Company established its business:—

“The acquisition of the minerals of this Province from the “G.M.A.” in 1858 made available for the public the Coals of Cape Breton, at a time when a very active and growing demand for gas coal was being created in the United States. The Civil War in that country accentuated this demand. Another circumstance favourable to the rapid development of this industry was the vast amount of American sail tonnage—steam vessel freighting was then in its infancy—at the disposal of the coal trade. This tonnage was confined to North Atlantic trading through fear of capture by Confederate cruisers further south.

The writer remembers seeing the various coal ports literally filled with tonnage of this class, ranging from the coaster of 150 tons to the three master of 1500 tons, a well built and beautifully fitted out fleet, some of them resembling the yacht class so closely that it almost appeared a desecration to tarnish their brightness with the dust of the coal cargo.

The supply of tonnage was so great that at times the delay to vessels often reached three and four weeks. Freights were very high, reaching \$7 and \$8 for New York and \$5 to \$6 to Boston: this was the green back age.

Our coal was sold as far south as Washington, and there was scarcely a port from New York east into which it did not penetrate.

This was the harvest time for our new collieries, particularly for the gas coal producers; the price obtained was \$2.40 gold per ton for coal screened over three quarter inch screens, and the demand exceeded the supply. The net result to the mine was a clear profit of at least one dollar per ton, and they prospered.

As for an instance: the Glace Bay Mining Company, under very heavy expense as it was for construction, harbor extension, etc., declared dividends of 25 per cent. on capital, doubled that capital and paid 15 per cent., added again one half making a

\$600,000 stock list and then paid 12 1-2 per cent. In addition to this considerable amounts were being placed to credit of Reserve Fund, which latter had, at the expiration of the Reciprocity Treaty (1866) reached about \$80,000. The stock of this company had previously reached considerably over 200, in the open market, but little changed hands.

With the abrogation of the Reciprocity Treaty there set in a steady and ominous decline for the coal trade, until by 1878, it reached bottom—not without strewing its course with wreckage.

Among the survivors was the Glace Bay Mining Company, whose conservative management enabled it to pull through free from encumbrances, to take advantage of the revival then setting in.

During even the very worst period in the coal history of the County this Company paid its shareholders a dividend, small at times, but without serious embarrassment.

This Company was the first, after the revival of trade, to introduce the system of freighting coal by barges towed by steam. In 1891 two barges of the "whale back" type were built at Lunenburg, each of 460 tons capacity; and the tug "C.M.Winch" was purchased, from the Boston Tow Boat Co., for towing them. They were put into the Halifax trade and proved a success from the beginning."

The American interests in the Little Glace Bay Mining Company—who are stated to have at one time included the Poet Longfellow—withdrew in A. D. 1865 and opened Caledonia Colliery, in the immediate neighborhood, on the "Phalan" seam. The coal proved 8 feet 3 inches thick and suitable for domestic, steam and gas purposes; but the attempt to create the artificial harbor of Port Caledonia, at the eastern angle of Big Glace Bay Lake, by defending a dredged channel with cribwork piers 400 feet long, proved disastrous. Only 17 feet of water could be maintained among the shifting sands of that locality; and after 1884 Caledonia coal was shipped in Glace Bay harbor, subject to

a harbor tax of 12 1-2 cents per ton for screened and 6 1-4 cents per ton on slack coal imposed by the Little Glace Bay Mining Company.

The following table exhibits the sales of Caledonia "Phalan" coal, up to 1892 :

Year.	Sales, Tons.	Labor Employed Men and Boys.	Average Quantity Raised per day. Tons.
1866	10	.....	.....
7	32	.....	.....
8	12,546	.....	.....
9	24,481	.....	.....
1870	28,267	.....	.....
1	25,600	73	120
2	44,186	130	204
3	65,442	196	300
4	34,593	127	264
5	12,734	78	149
6	31,565	88	208
7	23,248	91	158
8	19,072	75	163
9	13,384	55	165
1880	22,120	54	140
1	42,933	122	237
2	59,296	160	310
3	51,557	163	350
4	65,440	173	460
5	48,551	155	392
6	73,048	188	428
7	102,090	221	940
8	102,931	230	593
9	102,980	269	617
1890	145,373	288	630
1	144,995	338	653
2	107,200	.....	.....



The present "International" then the "Union" Mine was opened on the Harbor seam by a level from the base of the cliff on Indian Bay, in A. D. 1858. Five years later the International Coal and Railway Company, of New York, sunk and equipped a 96 foot shaft, and connected it with the older winnings and by twelve miles of railway—now part of the "Sydney & Louisburg"—with a loading pier erected in Sydney harbor. These expenditures proved unremunerative, and the property, nominally worth \$1,100,000 to the Bondholders, was sold by the Sheriff for \$200,000, in 1877, subject to \$11,000 arrears of royalty and a prior mortgage of \$45,000.

The coal has been largely used at the New York Gas Works and is said to have a steaming power equal to West Hartley, England, steam coal.

The following table records the sales up to 1892:

Year.	Tons.	Labor Employed Men and Boys.	Average Quantity Raised per day. Tons.
1858	696	.....	.....
9	1,358	.....	.....
1860	1,937	.....	.....
1	1,480	.....	.....
2	2,348	.....	.....
3	4,198	.....	.....
4	6,719	.....	.....
5	14,541	.....	.....
6	10,700	.....	.....
7	20,700	.....	.....
8	6,697	.....	.....
9	6,598	.....	.....
1870	10,937	.....	.....
1	80,200	254	540
2	20,498	126	161
3	72,215	179	262
4	29,898	123	197

Year.	Tons.	Labor Employed Men and Boys.	Average Quantity Raised per day. Tons.
1875	41,961	126	213
6	25,704	109	256
7	17,655	98	189
8	14,348	91	188
9	21,523	113	276
1880	58,897	167	438
1	76,285	210	483
2	102,927	290	610
3	96,997	299	544
4	80,798	.....	.....
5	87,485	210	530
6	106,149	305	722
7	102,485	248	.....
8	99,544	245	658
9	118,066	284	826
1890	133,076	319	628
1	124,677	372	686
2	105,479	.....	.....

The "Blockhouse mine" at Morien was re-opened by Mr. Marshall Bourinot, of Sydney, about 1860, and sold to the Blockhouse Mining Company, which built a large loading pier and drove two slopes from the shore to the apex of the basin.

The coal, though occasionally interrupted by wedge shape intrusions of the roof shale, like the Victoria seam near Sydney Harbor, proved to be one of the best domestic and gas coals in Nova Scotia, and it was exported in considerable quantities to home and foreign markets.

The land area of the seam, like that of the Hub in the adjoining basin, is limited by excessive erosion, to a very small area; and, as the narrow work of the colliery would have had to be extended a considerable distance under the sea before submarine winnings could be opened, a shaft was in preference

started to the underlying Gowrie seam. This sinking was not completed owing to financial difficulties, and in A. D. 1886 the plant was sold by the Nova Scotia Government to realize unpaid royalties, then amounting to \$12,706.

The sales of coal up to the cessation of operations were:

Year.	Tons.	Labor Employed.	Average Tons Raised Daily.
1860	3,730	.....	.....
1	7,620	.....	.....
2	16,900	.....	.....
3	15,690	.....	.....
4	70,630	.....	.....
5	76,635	.....	.....
6	89,900	.....	.....
7	71,200	.....	.....
8	57,887	.....	.....
9	73,933	.....	.....
1870	40,000	.....	.....
1	3,768	74	37
2	42,748	193	265
3	47,849	250	256
4	33,930	219	112
5	22,154	113	181
6	33,220	129	269
*7	61,938	186	438
*8	60,770	206	528
*9	27,509	172	410
*1880	48,475	164	367
*1	61,108	177	466
*2	61,753	178	389
*3	55,300	192	302
*4	23,668	113	164
5	7,316	73	119
6	2,913	40	.....
7	7,522	20	47
8	6,573	18	69
Closed			

\*Output



The underlying "Gowrie" seam, averaging about 5 feet 0 inches thick throughout the Basin, has a similar excellent reputation for steam purposes, and the mine opened in it by the Franco-British pioneers, about a mile further up Morien roadstead, was re-opened by Messrs. Archibald & Company, in A. D. 1861. These operators, who rank high among the "Fathers of the Canadian Coal Trade," sunk a shaft 20 feet deep near the shore, a second 80 feet deep further inland, a third—the Odiore Pit—205 feet deep, 900 yards from the shore, and a fourth, one and a half miles inland, and erected a breakwater for the protection of shipping, which has been purchased by the Government of Canada. The coal proved popular for steam purposes, and coked suitably for the treatment of copper ore in Newfoundland. Twelve "Beehive" ovens were therefore erected at the "Odiorne" Pit, and the product was shipped to Newfoundland. Owing to the limited market for slack coal, a Yeadon Briquette machine was also installed to utilize the surplus. The plant, which is said to have required 8-9 per cent. of pitch as a "binder," had a capacity of 54 tons per ten hours. The weight of each briquette was about 11 1-2 pounds and 195 were allowed to the long ton. They were found suitable for steam raising, but the plant fell into disuse.

Under Archibald & Co., assisted by their managers, the Andersons, this mine steadily became one of the most important in Canada, and its operations created the thriving town and marine coaling station of Port Morien.

The following reminiscences, of Mr. Charles Archibald, show the conditions under which this was accomplished:

"The American war between the North and South made a great demand for bituminous coal in New York and the Eastern States. American as well as Canadian capitalists expended large sums in developing the coal mines in Cape Breton, and in 1864 the output for the island had more than doubled.

The impetus given by the American trade reached its highest point about the time the Reciprocity Treaty was abro-

gated, after which the shipments declined rapidly until 1872. In 1873 there was a great boom in coal, owing to the strikes and high prices in Great Britain. Coal was sold from \$2.50 to \$3.75 per ten f. o. b. at the loading ports in Cape Breton, although prices in 1872 were only \$1.50 at the out-mines and about \$2.00 at Sydney Mines. Besides the price being good the demand exceeded the supply, but this prosperity was of short duration.

The price and demand declined in 1874 and the four following years brought ruin to coal mining capitalists, and starvation to miners. Coal mining plants in Cape Breton were closed down, mining villages were deserted, and some capitalists made a total loss.

The coal trade with the United States practically ceased, when the import duty was imposed by the United States; there was no other important market for Cape Breton coal (from the junior collieries). Sydney Mines supplied Nova Scotia, the Maritime Provinces and Newfoundland with house coal, as it had done for many years before any other collieries were opened: and the coal consumed in the Maritime Provinces for other purposes than house fuel was at that time insignificant. Quebec was our proper and rightful market, but we could not get a foothold there. The trade up the Gulf of St. Lawrence was almost entirely done by sailing ships, and those vessels brought English and Scotch coal as ballast when they could not get a small freight for cargo. In this way Quebec and Montreal were supplied with coal.

The coal owners had agitated for some years to have a duty on coal, and the final salvation of the coal miners of Cape Breton and Nova Scotia appeared with the National Policy in 1879. From this time a steady and permanent advance in the coal trade has continued and must continue as far as our home market is concerned. It was not rapid at first for many reasons: there was a prejudice in favor of English and Scotch coal; the transportation was difficult, and it took some years to get suit-

able steamers to carry the coal from Cape Breton ports, but in the end this was accomplished."

The Gowrie Colliery was acquired by the Dominion Coal Company, in 1893; but it was closed late in 1897, doubtless owing to their failure to obtain free access to the New England market. To preserve Port Morien from the ruin (inflicted upon it by this step) the author established a new colliery upon a portion of the submarine extension of the Gowrie seam not owned by the Dominion Coal Company, in 1899. The importance of the Morien submarine coal was not then recognized by the Province; but the author's reconaissance and practical confirmatory operations in the district have dispelled this misconception and demonstrated that the Morien Basin holds 300,000,000 tons of available submarine coal worth \$30,000,000 to the Provincial Revenues, and \$600,000,000 to Canada.

The following table exhibits the sales of Gowrie coal by Messrs. Archibald & Co. to 1893—the Dominion Coal Co., 1893-1897, and by the Gowrie & Blockhouse Collieries, Ltd., and its successors, The North Atlantic Collieries, Ltd., 1900 to date:

Year.	Tons.	Labor Employed.	Average Daily Output—Tons.
1862	2,800	.....	.....
3	15,000	.....	.....
4	28,700	.....	.....
5	34,805	.....	.....
6	33,200	.....	.....
7	38,500	.....	.....
8	64,137	.....	.....
9	45,745	.....	.....
1870	52,017	.....	.....
1	42,400	148	199
2	46,703	144	204
3	54,079	247	219
4	35,121	190	192



Year.	Tons.	Labor Employed.	Average Daily Output—Tons.
1875	31,133	145	176
6	26,260	166	247
7	24,851	139	238
8	30,956	154	306
9	31,242	153	215
1880	46,204	162	292
1	61,369	195	343
2	65,364	235	303
3	70,550	213	355
4	82,340	198	538
5	77,580	227	670
6	88,945	295	700
7	119,754	283	738
8	108,372	290	814
9	100,445	299	739
1890	124,642	312	800
1	152,367	342	.....
2	138,413	.....	.....
3	113,430	(Acquired by Dominion Coal Co.)	
4	127,018		
5	41,000		
6	50,166	(Raised)	
7	About	90 cutters employed for 89 days	
8	Closed		
9	Closed		
1900	Submarine extension of Gowrie seam opening out.		
1	12,310		
2	14,880		
3	22,338		
4	29,120		
5	32,182		
6	35,924		
7	7,735		
8	46,480	Average persons employed 198	

The North Atlantic Collieries, Limited, is further carrying out the author's plans by re-opening the Blockhouse seam, to similarly work its submarine extension.

The expansion of the Nova Scotia iron and steel industry has directed attention to the metallurgical properties of this excellent seam.

Judging from analyses of samples, taken from the workings of the old Blockhouse Colliery in 1907, these are satisfactory. Coke manufactured from washed samples yielded, Sulphur, .82; Ash, 2.40. Chemically, nothing better could be desired. The coke seemed to be a dense, hard, merchantable commodity of good quality.

In A. D. 1862, the Ontario, or Clyde Colliery, now represented by "No. 6" mine of the Dominion Coal Company, Ltd., was opened in the Phalen seam. Coal was shipped at a small loading pier near the mine; but about 1871 the shipments were made over a light railway, built mainly on trestles, to Port Caledonia.

The following table exhibits the sales up to 1892:

Year.	Tons.	Labor Employed.	Average Daily Output In Tons.
1862	30	.....	.....
3	508	.....	.....
4	4,023	.....	.....
5	9,048	.....	.....
6	5,956	.....	.....
7	253	.....	.....
8	851	.....	.....
9	2,317	.....	.....
1870	2,279	.....	.....
1	1,830	21	18
2	2,600	41	21
3	6,913	46	34
4	5,877	43	43

Year.	Sales, Tons.	Labor Employed.	Average Daily Output.
1875	5,426	46	39
6	11,288	75	58
7	12,380	77	51
8	18,831	85	102
9	14,332	75	77
1880	7,852	40	53
1	13,410	57	112
2	23,366	72	107
3	19,522	85	147
4	5,715	34	.....
5	7,415	36	66
6	8,251	35	74
7	7,447	31	52
8	4,394	20	32
9	2,694	27	30
1890	8,387	46	57
1	2,709	22	26
2	28	.....	.....
1904 Dominion No. 6 opened.			

In May, A. D. 1871, the Glasgow & Cape Breton Coal Company, Limited, of London, England, opened the Reserve Colliery by slopes in the Phalan seam 6 feet 2 inches thick, 3 1-2 miles west of Little Glace Bay. The upper or 4 feet 2 inch bench of the seam was uniform, but the lower was deteriorated by shale. The quality, however, improved to the dip and the 3 feet 0 inches shale parting decreased to 3 inches within 2040 ft. of the outcrop. This Company, ultimately reorganized into the Sydney & Louisburg Coal & Railway Company, Ltd., of London, built the village of Reserve Mines, and connected it with Sydney Harbor by a narrow-gauge railway, extended to Schooner Pond in 1872 and to Louisburg in 1877. Several cargoes of coal were shipped from the Louisburg Pier in the Autumn of 1879-1880. but S.W. of Reserve Mines the railway was allowed to fall into



disuse. The mine was connected with the Emery seam, 4 feet 9 inches—5 feet 0 inches thick by a 700 feet drift at an angle of 1 ft. in four, from a point 850 feet down the main slope, in 1884-5, but very little coal was drawn from the lower seam.

The following table exhibits the sales of coal at Reserve up to A. D. 1892 :

Year.	Sales, Tons.	Labor Employed Men and Boys.	Average Quantity Raised per day. Tons.
1872	27,802	158	243
3	41,183	244	226
4	24,826	167	276
5	11,752	94	182
6	876	10	.....
7	116	10	.....
8	7,346	34	75
9	17,269	79	181
1880	31,614	105	248
1	68,884	200	347
2	74,432	216	432
3	104,777	262	470
4	86,550	262	513
5	72,547	213	616
6	83,402	240	467
7	76,205	186	425
8	109,000	235	531
9	110,225	315	500
1890	139,777	313	600
1	154,656	228	675
2	135,836	.....	.....

This important colliery was long operated by Mr. D J. Kennelly, the well-known founder of the project to erect a Memorial to British arms on the ruins of the old French forts of Louisburg.

*Bridgeport Colliery*—Closed by the General Mining Association in 1849 was re-opened in 1884 by Mr. Henry Mitchell, who connected it via the "International Mines" railway with the International Pier in Sydney Harbor.

The following table exhibits the sales of coal, and is in continuation of the earlier table of sales :

Year.	Sales, Tons.	Labor employed.	Average Tons Raised daily.
1884	3,045	32	34
5	12,583	35	116
6	12,519	24	135
7	18,014	27	107
8	22,327	32	108
9	24,222	34	98
1890	28,692	50	116
1	32,547	44	132
2	31,328	.....	.....

In A. D. 1867 "Victoria Mine" was opened in the Victoria seam, 6 feet 10 inches, near the south entrance to Sydney Harbor. A slope driven into the submarine extension of the coal was abandoned under the apprehension that the "cover" was too thin, and a second slope was sunk on the full 38 degree dip of the seam; but the new winnings were connected with the "old" when the strength and coherence of the submarine carboniferous in that district was better understood. The mine was connected by rail with a loading pier within the south bar of Sydney Harbor.

Operations were suspended in 1879, '80, '81 and 1882, resumed at another point on the same seam in 1883, and finally abandoned in February, 1898.

The following table exhibits the sales up to 1893.

*The following table exhibits the sales up to 1893.*

Year.	Tons.	Labor.	Average Daily Output—Tons.
1867	287	.....	.....
8	2,500	.....	.....
9	4,909	.....	.....
1870	7,200	.....	.....
1	17,400	90	60
2	19,422	152	53
3	11,112	53	178
4	11,840	81	176
5	14,700	104	110
6	13,122	90	108
7	10,000	102	124
8	10,500	62	97
9	.....	Not in operation	.....
1880	.....	do	.....
1	.....	do	.....
2	.....	do	.....
3	154	82	.....
4	10,408	119	46
5	39,926	168	159
6	46,744	163	170
7	55,651	180	240
8	72,503	252	380
9	91,120	316	432
1890	77,367	305	333
1	96,479	352	415
2	108,332	.....	.....
3	66,935	313	435
Acquired by Dominion Coal Co., Ltd.			



## CHAPTER III.

The organization of the collieries described in the last chapter proceeding, as predicted by those who insisted upon the abolition of the Mining Association's monopoly, from the native enterprise of the Nova Scotian people, forms one of the most interesting chapters in our coal trade.

The influence of the Mining Association, which had expended its capital in equipping large collieries, was naturally against these efforts to multiply the Nova Scotian mines; and the lack of experience and adequate capital, the scarcity of sheltered harbors, and the almost total lack of skilled labor, the competition of British coal, and the excessively limited market for small coal, increased the difficulties of these early operators. To those circumstances should be largely ascribed the unscientific manner in which the early Nova Scotian coal mines were frequently operated, the ventilation of most of them more by "the miraculous interposition of Providence than by the ingenuity of man," and the toleration of a class of mine managers who sometimes drove levels without cross-cuts, under the impression that the coal was so pure that the miners did not need air! About A. D. 1866, artificial aids to ventilation were unknown at most of the Nova Scotia collieries. As a rule the operators conducted the air to the vicinity of the working faces, and left it to find its way to the nearest outlet, relying upon the difference in level and the internal and external temperature to promote the circulation. Under these circumstances the air currents sometimes reversed, and the intake became the outlet!

The dangerous system of opening collieries at the base of the cliffs, copied, doubtless, from the earlier French and British, occasionally threatened some of the Cape Breton mines with inundations from the ocean, and dams had to be built to shut out the tide. The short-sighted policy of leaving small pillars to sup-

port the roof proved more detrimental to economical mining, and considerable tonnages of coal have been lost in the crushed districts. The lack of proper surveys also proved inconvenient; but by A. D. 1866 most of the operators kept working plans, laid down, however, on a variety of scales.

The coal was riddled by hand, frequently in the mine, and from 5 per cent. to 25 per cent. was thrown aside as smalls, but this proportion was sometimes increased by a further 50 per cent, of "slack" removed from the "banked coal" at the end of the winter. Very little of these "smalls" was saleable in any part of the Sydney Coal field, even below cost, as late as A. D. 1871; much of it was, therefore, used to ballast the colliery railways, piers, etc.

The following table showing the approximate average cost of raising and shipping a ton of coal, in the Sydney Coal Field, about 1872, exclusive of pumping and ventilating, is based from the most reliable sources, upon a production of 50,000 tons per annum:

	Per Tons.
Mining, say .....	50c
Putters .....	6
Underground haulage.....	5
Timbering .....	4
Winding.....	2
Furnace, watchmen & roadmen ...	2
Overseer, assistants, engineers and firemen at bank.....	3
Screening and loading .....	6
Loading Bank coal .....	12
Salaries and incidentals .....	10
Rail haulage to whf. say 5 miles at 3c.	15
Loading at wharf .....	3
Royalty and taxes.....	11
Interest on capital, insurance, wear and tear, agencies, discounts and contingencies, say .....	25

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Total cost per ton f. o. b..\$1.54

Fortunately for Cape Breton, the local farmers and fishermen readily adapted themselves to coal-mining, and sympathized with their employers' efforts to establish a native coal industry.

At Sydney Mines the cutters were paid 46 cents per ton in the whole and 40 cents in the broken coal, filled into tubs, about 1872, The slack was hand-riddled in the mine, and the miners found their own powder and lights. Narrow work, at which the average daily progress per pair of cutters was 4 ft. 6 in., was paid an additional 80 cents a lineal yard. At these rates the miners sometimes earned \$60—\$80 per month; but the men employed on the surface did not average more than 85c. per day. Wages at the smaller mines, where labor conditions were less favorable, usually ruled 5c—10c. higher than the Sydney Mines scale. The losses on the small coal were a constant impediment to financially successful coal mining.

"What to do," said one of the Mines Reports, "with the waste coal is a serious question at several Cape Breton collieries. While large coal is in such small demand at present low prices it is felt impossible to find a market for all the small and inferior coal; heaps of slack and waste coal consequently lie about the pits and along some of the colliery railways.

The loss of the New England market after the abrogation of the Reciprocity Treaty with the United States, in 1866, was a very severe blow to the coal trade; and in 1875 representatives of most of the Nova Scotian colliery owners expressed their belief, at Stellarton, that it was impossible to continue operations on the existing basis. Their collieries, they complained, were kept open at a loss, (principally owing to competition outside of the Dominion); and they proposed to partially control the trade by regulating the output, the prices and the rates of wages. Their difficulties were increased owing to the fact that Nova Scotian, particularly Cape Breton coal, was considered inferior, in



competition with more carefully prepared foreign coal; doubtless at times justly, owing to lax mining methods, and its deterioration on the crude banking stations at the mines. The following analyses, published in 1875, and a number of years ago, are of some interest in this connection:—

*SEAMS.	Specific Gravity.	Moisture and Volatile matter.	Fixed Carbon.	Ash.	Sulphur.	Coke in lbs. per ton.	Cubic feet of gas per ton.	Candle Power.	C. ft. of gas purified by 1 bus. Lime.	Authorities.
Joggins, (Main).....		38.80	56.00	5.20						Dawson.
Victoria .....	1.34	36.00	51.84	12.16			9,340			
Spring Hill, (13 feet seam) .....		25.38	60.95	13.67						How.
				10.80	.84					Woodhouse.
Black seam 11 feet .....		35.39	60.46	4.15	.22					Hartley.
		31.08	64.94	3.98	.31					
				5.05	1.09					Dr. Percy.
	1.32	29.63	56.98	13.39	.77		7,180	15		Johnson.
Albion, (Main).....		29.53	60.83	9.62						Dawson.
	1.30	25.75	66.50	7.74	.55					How.
Albion, (Deep).....	1.33	26.74	61.65	10.25	.86					Broome.
	1.34	23.00	68.50	8.50	1.68					How.
McGregor.....	1.32	22.90	67.85	9.35		1640	9,500	13		Manhattan Gas.
Stellar.....	1.10	66.56	25.23	8.21	.00					How.
	1.32	34.37	57.57	7.55	.50					Broome.
Acadia .....	1.31	29.93	60.35	9.46	.26					Broome.
	1.32	31.69	60.32	7.56	.42					Broome.
McBain .....	1.36	25.45	62.63	11.92	.49					How.
Collin's .....	1.27	36.75	57.10	6.06						Chapman.
		38.80	55.80	5.40						Dr. Torrey.
Blockhouse.....		40.80	55.70	3.50		1460	10,217	17	2304	Manhattan Gas.
		31.94	62.79	5.25	3.75					Harrington.
Phelan .....	1.32	37.26	58.39	4.35	2.17		9,500	16.5		
		35.47	61.67	2.86	2.06					Harrington.
Emery .....		38.10	58.45	3.45			9,500			Percy.
		31.75	66.85	1.40	1.21					Harrington.
Lorway (Gardiner).....		34.33	61.97	3.70	1.18					Harrington.
		36.54	62.53	.93		1484	9,560	13	1945	
Hub .....		28.62	65.85	3.24	2.29	1342	10,080	16		Harrington.
	1.27	36.28	58.56	5.16		1480	9,846	16.7	1850	
Harbor .....		30.21	67.78	2.01	.90					Harrington.
		38.50	56.50	5.00						Manhattan Gas.
		34.09	62.92	2.99	2.29	1440	10,106	17	2314	Harrington.
	1.28			7.81	2.18	1441	9,900	17		Imperial Gas.
Lingan .....		35.20	60.80	4.00		1450	9,520	13	2200	Chandler.
		34.23	63.98	1.79	.77					Harrington.
		30.03	66.91	3.06						How.
Ross .....		38.70	58.40	2.96						Dawson.
	1.33	26.94	67.57	5.49						Johnson.
Sydney (Main).....		31.87	64.59	3.54			6,500			How.
	1.30	34.18	61.50	4.32	1.24					How.
Edward's.....	1.27	36.74	56.97	6.27						Chapman.
	1.33	28.88	60.45	7.25	3.42					
McAuley.....		36.15	58.01	5.70	2.34	1510	9,000	15		Richard.
		32.07	64.43	3.50	2.86					Harrington.

\*Published A. D. 1875.

## COMPARATIVE ANALYSES.

	Volatile Matter.	Carbon.	Ash.
Pennsylvania, U. S. A.....	29·50	64·40	Omitted
Virginia .....	33·68	57·76	8·56
Indiana .....	39·00	52·00	9·00
Illinois .....	36·59	59·47	3·94
Iowa .....	44·00	48·50	7·50
Missouri .....	34·06	50·81	15·13
Newcastle, England.....	37·60	57·00	5·40
Staffordshire, " .....	37·86	59·64	2·50
Derbyshire, " .....	35·10	61·65	3·25
Yorkshire, " .....	35·67	62·08	2·25
North Wales .....	36·56	57·49	6·25
Pictou, Nova Scotia .....	29·63	56·98	13·39
Sydney, Cape Breton .....	34·07	61·43	4·50

After the abrogation of the Reciprocity Treaty the total dependence of Cape Breton upon the export trade was more keenly felt, and the imperative necessity for a progressive demand for coal quickened the scheme for the Confederation of Canada under a central Government capable of nursing national industries. But after nearly a decade of Confederation the domestic coal markets still proved inadequate.

"A local demand," said the Mines Report for 1876, is the great want in Cape Breton. If manufactories depending on cheap fuel, for successful competition with foreign made goods could be started, total stagnation might be avoided and a greater regularity or, at least, some occupation furnished to the colliers and laborers, during the season of the year when shipping is impossible, and the banking of great heaps of coal is inadvisable. Cheap fuel is recognized as the great lever of the age, but, unfortunately, although favorably situated for the importation of raw materials and the exportation of manufactured products, these very same facilities militate at present against the establishment of manufactories in Cape Breton, since the balance of trade is against

Canada. An excess of tonnage being required to export her timber and grain and coal, the less bulky and more valuable articles of commerce are brought into the country at merely nominal rates by vessels seeking outward freights. Even such bulky articles as salt, coal, and iron are carried at very low rates. Coal and pig iron are also taken by timber ships for ballast. During the past spring the rates to Quebec were about seven shillings per ton, while contracts were at the same time made to carry coal from Pictou, N. S., to Montreal, at \$2.12. So that it appears coal was brought across the Atlantic from Cardiff at 44 cents less freight than it could be taken from Pictou up the Gulf. The rates from Pictou fell during the summer to \$1.87 and \$1.75 per ton, but even the lowest of these rates still placed Pictou coal at a disadvantage in comparison with Scotch and Cardiff coals."

So pressing had the necessity for larger home markets become at this time that about 1875-6 some attention was paid to the Ontario market; but, although Cape Breton bituminous coal was considered superior to the cheap Ohio coal used in Middle Canada, the lack of return freights for the Nova Scotia colliers and the competition of Ohio coal in Ontario seemed to present insuperable obstacles to the western extension of the Nova Scotian coal trade. The basis upon which Cape Breton would have had to compete with American coal in the Ontario market at that time appears from the following:—Before a special committee at Ottawa in 1876 on the "Recent Depression of Trade," Mr. McGregor, M. P., Essex, stated that he was interested in a colliery in the Shawnee Valley, Ohio, which sent some 75,000 tons of coal into Canada in 1875. The coal was shipped at Sandusky, 160 miles from the mine.

	Ton of 2,000 lbs.
The coal cost at the mine.. . . .	\$ .90
Railway Freight.. . . .	1.60
Shipping Charges.. . . .	.25
Cost F. O. B. Am. Cy.....	\$2.75



Freight by vessel to Windsor was about 50 cents, to Port Stanley 65 cents to Hamilton and Toronto \$1.25.

The difficulties of some of the Nova Scotia operators were doubtless increased by the interest burdens of unnecessary expenditures of capital at their collieries. "Looking back at the history of previous mining operations," said the Mines Report for 1875, "we see the unnecessary expenditure of at least \$1,250,000 in the two railways, seven miles long, running side by side to the Middle River of Pictou, in the two branches from Westville to the main line at Stellarton, three and a half miles long, in the two railways, running together for ten miles from the out mines to Sydney Harbor, in the two artificial harbors at Glase Bay and in two breakwaters at Cow Bay (Morien)."

These duplicated expenditures of colliery capital were doubtless forced upon incoming operators by the hostility of the existing companies to the creation of competing mines.

The Nova Scotian, particularly, the Cape Breton coal trade, dependent to so great an extent upon the export trade and exposed at home and abroad to the competition of British "ballast borne" coal, obviously suffered, as already pointed out, the severest reverses by the abrogation of the Reciprocity Treaty with the United States; and when it became apparent that the Treaty would not be renewed, that the Ontario market could not be wrested from the Ohio coal owners, and that the British coal owners looked upon Canada as a dumping ground for their surplus outputs, the Nova Scotian operators were forced to demand fiscal protection which would virtually create a close Canadian market for their coal. Similar demands were made by other Canadian manufacturers and the National Policy of Canada was adopted to shelter Canadian Collieries and Factories from the ruinous competition of foreign surpluses, carried to Canada at nominal rates. This policy, moreover stimulated new manufacturing industries which increased the demand for large, and particularly for the small coal of the mines. The following

approximately correct data on labor conditions in 1880, during which year the operators produced 1,032,710 tons of coal, shows the conditions at the collieries after the inauguration of Protection :

Coal cutters employed during 1880.. . . .	1496
Laborers employed during 1880 .....	879
Boys employed during 1880.....	600
Average quantity of coal mined per cutter in tons..... . . . .	690
Average wage payment per ton.. . . .	\$0.39
Average miners wage while working per day..	\$1.45
Average laborers wage while working per day.	.95
Average boy's wage while working per day..	.65
Mines worked per annum, average in days....	188
Average monthly deduction from wages for rent, doctor, coal and school, .... .	\$2.80

[While at work the cost of all labor and material per ton was 63 cents at one Cape Breton colliery and not much more at others in 1878].

The relations between capital and labor in Cape Breton, about 8 years later ie in A. D., 1888, are recorded in the State papers of Canada, as follows:—

Gowrie Mine, Morien. From the mine owners standpoint:—

Employ from 100—160 cutters, several shaftmen, 28 drivers and 48 boys underground, and about 12 Blacksmiths, carpenters engineers. Forty cents per day the lowest pay to trappers, up to \$1.—per day for trappers, couplers, drivers and assistant drivers.

Thirty-eight cents a ton paid for cutting coal (unscreened); in winter 31 cents; average wages being \$2 in summer and \$1.40 to \$1.50 in winter. Company owns nearly all the houses the miners live in at 50 cents a month, are kept in good repair, and cost \$300 each. Rent only covers insurance. Coal is supplied miners at 20 cents a load for slack and 50 cents for round, including hauling. Men pay 40 cents for doctor's fee, single men 30 cents; boys from sixteen pay 30 or 20 cents, small boys 10 cents.

Men with families are charged 30 cents and single men 20 cents, on account of schools, which is collected when name appears on book. Poll-tax not obligatory; company pays it. Children are provided by the district with books, which also builds the schools. Company have store, but men are not obliged to deal there; majority do not when they have money. No notice of leaving required and due bill given for amount due. Ten or twelve men own houses valued at from \$300 to \$500 or \$600, owning the land they are built on. Company sells land at from \$20 to \$30 an acre, and its property is assessed at \$50,000 or \$60,000; entire taxes between \$1,000 and \$1,100. Boys under twelve not taken. With few exceptions men are sober, if sale of liquor were stopped it would be a boon to them. The difficulty in regard to fortnightly pay is that, as every pound of coal has to be weighed it takes three or four days to get the information necessary for making up the books; and then to make up several hundred accounts takes two weeks. Does not believe that fortnightly pay would benefit the men, and objects to it on the ground of extra labor and expense to the company. Other stores in Cow Bay will credit the men, and at the company's store they are charged no more in winter than in summer, though credit has to be given them from November to July.

Gowrie Mine, Morien. From workman's standpoint:—Receives 38 cents a ton, shipping price; banking 31 cents. Generally works eight or nine hours a day, a full month's earnings being \$52. July and August only months they work full time. From 90 to 112 days a year's work; not over 115 or 120 days. Gets no work when not working in mine. Yearly earnings vary from \$300 to \$350; lowest be 256, gross. Rents one of company's houses and pays 50 cents a month; two rooms upstairs, two down; that is the average rent. Not very comfortable, but wells are handy. Pays for coal (screened) 50 cents, and 20 cents a load for slack, delivered. Is single, and pays 30 cents to doctor and 20 cents for school per month; married men pay doctor 30



cents, and 40 cents for school. Boys under sixteen, working or not, pay 15 cents for doctor, and 10 cents for school. Trappers get 40 cents a day; drivers, 70 to 80 cents; laborers, 80 cents to \$1. Would take youngest boy to be from eleven to twelve. Is paid monthly, but would prefer fortnightly. Store in connection with mine, but not compelled to go there. Thinks men get better value when paid fortnightly. Some articles as cheap in company's store as in others. A benefit society would be supported in his locality. Sick or disabled depend on the charity of their fellow workmen, having no other means of support. Forty to fifty Dollars raised for this purpose a year. Employers have no objection to men being active in the interests of their Miners' Association.

Little Glace Bay. From mine owners standpoint:—Number of hands varies from 160 to 200; of these 90 to 120 are miners. About twenty-five boys are employed; laborers and boys sixty or sixty-four. Laborers receive 85 cents to \$1.20; mechanics, \$1.10 to \$1.30; machinist, \$1.50; blacksmiths, \$1 to \$1.25; boys are employed as trappers, twelve years being the youngest. Company has houses, which miners occupy, at a \$1.50 a month, some at \$2 for mechanics. Sanitary condition not so good as might be; no water closets. Is no store in connection with company, but there is one the private property of president; never discriminate as to who deals there. A number of miners own houses, valued from \$300 to \$600 or \$700. Company does not sell land, and its property is assessed at \$55,000; gross tax, last year, \$1,400. Charge men not rate-payers 15 cents a month school tax; law enforces \$1 per male over twenty-one years of age. Average time of five best men, 193 days and fair, 180 days; wages, \$1.977 and \$1.392.80, respectively. In shipping season for run of mine pay from 36 to 38 cents a ton; 37 cts. the average. Men recommend doctor and company accepts him, if not objectionable; fee, 40 cents for married men 36 cents single monthly. Wages paid monthly; more frequently would be a benefit to men; but would

entail expense of another clerk ; sub-pay would be hardly possible. A good man goes down at 6 a.m. and comes out at 3 or 4 p.m.; sometimes 2 p.m. They must go down at 6 and can come up when they choose. Lower all men down. Does not charge for picks, but men pay for shovels, powder and oil. Sobriety of men very fair, but would favor a law prohibiting sale of liquor within three or five miles of mines. Children attend school regularly, and boys in mine, also, when idle. Officials at one time tried to stop sale of liquor but efforts were ineffectual. Fined for sending up dirty coal only. Do not discriminate against men belonging to Miners' Association. No provident or benevolent society. A railway to Louisburg would benefit all the collieries in Cape Breton. Would prefer to see it owned by the Government, but if a company owns it the Government should make some provisions to ensure the other company the right to ship over the road at equal rates with owners. Miners are not obliged to deal at company's store. Their material condition has improved very much during last five or six years, and they are becoming more provident and sober, as is proved by their building houses and owning land.

*Number of Days Worked each Month Little Glace Bay Mine.*

NAMES.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total Days.	\$	cts.
James Adamson..	5	....	3	18	3	24	21	26	23	22	16	11	173	473	90
Henry Dulaop.....	5	....	3	19	17	25	21	26	25	23	14	10	188	348	33
Dan McDown....	5	.....	18	18	18	26	21	26	24	23	17	11	207	411	90
Alex. McDonald..	5	....	3	18	18	26	21	26	24	23	17	11	192	374	74
Ronald McDown..	5	2½	17	19	17	25	21	26	25	23	14	10	204½	368	89
													963	1977	76
															2 00
Wm. Grant .....	5	....	2	17	17	26	20	26	25	23	17	11	189	298	98
Angus McLeod ..	5	.....	3	18	18	25	18	19	25	19	15	8	173	299	86
Alex. McGilvey..	5	....	11	19	17	24	20	25	25	23	16	10	195	293	27
John McAug.....	5	.....	2	18	16	19	18	19	23	19	14	5	158	237	40
Allan McIntyre..	5	....	3	18	18	25	21	26	24	23	17	4	184	263	29
													899	1392	80

Average, per day..... I 52



Little Glace Bay Mine. From Workman's standpoint:— About 45 pairs of men employed; is a coal cutter; average hours 6 a.m. to 4 or 5.30 p.m. Is paid per ton from 41 to 43 cents according to thickness. From April to Sept. 1887 earned \$198.60. Pays for powder, oil, doctor, school and rent. Wages about the same as in other mines. Rents company's house for \$1.50 a month. Two wells. Thirty or forty families live around. Not a privy for each family, but there is one on the premises owned by the company. Is paid monthly, but thinks fortnightly would be a benefit. Men complain of monthly payments. Belongs to Miners' Association. Thinks president owns store. Amount expended by men taken out of monthly payment, but it makes no difference if they do not deal there; could do better with cash. When on short time most men run into debt. Thinks there are fifteen or sixteen drivers, and three or four cutters. Trappers get from 40 to 50 cents a day; drivers, 50 to 70 cents; laborers, 30 cents. Pays doctor 40 cents and school tax 15 cents a month. Does not think the school tax legal. Has spoken to manager, but he would not allow it. Besides school tax, he pays statute labor, \$1; poll-tax, \$1; poor rates, 30 cents. Average wages, \$242 a year. Last July, 1887, he cut 66½ tons of coal, and was credited with \$33.38, and 2 cubic yards, \$1.60, total, \$35.13. Against this was charged: rent, \$1.50; coal 25 cents, about two loads; oil, 80 cents; powder, \$3.24; school, 15 cents; doctor, 40 cents; tallow, 30 cents; store account, \$28.49—not so much every month. Youngest boys not under twelve, and are well treated. School tax a fixed sum, and stopped in company's office. Men's impression that it is collected without authority. Last year miners, for the first time, had a voice in the election of school trustees. One miner was elected. Submits memo, of earnings of two men last year—\$334.55; also, a memo, of two other men—\$150.191-2, each Cannot account for difference. Coal may have been easier or better.

*Account of Earnings for Months of 1887.*

	Total Amount Earned.	Rent.	Coal.	Powder.	Oil	School.	Doctor.	Tally.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	cts.	cts.	cts.	cts.
March .....	11 62	1 50	0 50	0 36	.....	0 15	0 40	0 30
April .....	22 51	1 50	0 25	1 80	0 50	0 15	0 40	0 30
May .....	27 87	1 50	0 55	1 26	0 50	0 15	0 40	0 30
June .....	38 57	1 50	0 38	2 80	0 80	0 15	0 40	0 30
July .....	35 13	1 50	0 25	3 24	0 80	0 15	0 40	0 30
August .....	33 94	1 50	0 25	2 60	0 90	0 15	0 40	0 30
September .....	40 67	1 50	0 38	2 52	0 80	0 15	0 40	0 30
October .....	35 38	1 50	0 38	1 44	0 80	0 15	0 40	0 30
November .....	26 55	1 50	0 37	2 16	0 60	0 15	0 40	0 30
December .....	14 58	1 50	0 63	0 36	0 40	0 15	0 40	0 30

Condition of Trimmers, by Superintendent of Trimmers.—  
 Little Glace Bay:—To trim a ship of 1,000 tons fourteen men, with some ships, more required. Lights used are at ship's cost. The charge for trimming is from 5 to 6 cents per ton, of which the agent of the company gets 1 cent. He collects and pays out the trimmage money, and the men think him overpaid, and that to give him equal with each man employed would be sufficient. Trimmers work about 160 days yearly, the greatest pay being about \$3 and the smallest 40 or 50 cents. The work is very hard, and sometimes begins at 3 or 4 a. m., to suit the tide. At the International Mine the men are paid \$1 to \$1.50 a day, and when not trimming have to work about the wharf. Trimmers who are on shares will average about \$1.25 a day. In 1887, the best year since 1873, they earned a little over \$300. Previous years the average was under \$200. The dust is sometimes very bad, and there is no time to use a sponge, to keep it from the lungs, or to come on deck for fresh air.

International Mine, Bridgeport. From mine owner's standpoint:—

No Company store. Assessed value of Colliery \$65,000. No objection to Trades Union.

Company own about eighty-six houses and rent thirteen or fourteen. Charge men \$1.50 a month for a plastered house and \$1 for a sealed one. Generally four rooms on the two floors. Every man or boy of the 400 or 500 on the books is charged 30 cents a month for school tax. Married men pay 40 cents a month for doctor, and single men and boys 30 cents. This entitles them to attendance and medicine. Child births are \$4 extra. Doctor is appointed by agreement with men. In giving employment no preference is shown to house tenants of company. No fines, except when a man sends up all slack he loses part of it, which seldom occurs. Legal minimum age for boys is thirteen, and are always questioned on this point before employing them. No expenses paid by company to injured men, nor is there a benefit society among them, which company would willingly subscribe to if established. Men are paid for cutting coal according to seam, from 38 to 43 cents per ton of everything sent up, slack, round—the run of the mine, as it is called. Men leaving without notice get due bills for full pay, payable on the 15th of the month. In winter the men get 7 cents a ton less for banking than in summer, when company can put the coal right into the cars. Total days' work for miners in 1887, 8,317 days; total wages paid miners \$48,376; deductions for oil \$154.40; for powder \$2,110.67; for doctor \$1182.63; for school \$1006.20; school tax assessed on company \$11.50—showing a loss of \$143.84. Wages given above are those of miners only, the total amount of wages being \$92,235. Men can buy oil and powder either from the company or outside storekeeper. Half rates charged for rent during January, February and March. Coal 40c. and 25c. per half ton.

International Mine. From Workman's standpoint:—

Is a coal cutter. Works in pit nine hours a day. Goes down about 6.30 a.m. and comes up between 4 and 5 p. m. Thinks he works seven months a year, during the other five generally idle. When working full time would earn of clear money between \$1.50 to \$1.75 per day. Pays out of that for powder, oil, rent, coal.



doctor and school—doctor and school 70 cents. Company sharpens tools and supplies picks. Has to buy lamps. Is paid monthly and gets credit if money spent before end of month. Rents company's house—three rooms, including up-stairs—\$1.50 a month; some pay only \$1. Not many miners own houses, but a good many own farms. House is well drained and pretty well finished; very good wells.

Caledonia Colliery, Glace Bay. From the owner's standpoint:—

Number of hands during summer average 150 cutters; for whole season of ten months, 122. Average of best cutter \$460 a year, and smallest pay to inferior cutter \$290; average monthly pay of all cutters during summer is \$42. All taxes come off. Some employees own houses, but company own houses in which majority of them live. Rent for three rooms, 75 cents; cannot say how many rooms in \$1.50 houses. One person to look after sanitary condition; carpenters look after repairs. Company has sold a few lots; last few years not many; price low; land not valued highly. Men owning houses and those living in company's house are discriminated; company's preferred being on the spot. Taxes of company, \$1,200; assessed value of property, \$55,000. A doctor is in connection with works, the company charging 40 cents a month to married men and 30 cents to single men; boys earning less than 50 cents a day are not charged. All getting men's pay are charged 15 cents per month school-tax while working. Best cutting rates, 35 cents a ton; working pillars, 30 cents; a consideration given for difficult places; average between 33 and 36 cents. No regular system of fining, and, as far as he knows, no fine for dirt in coal. Youngest boy employed is thirteen. Coal is supplied miners at 25 cents for slack, and for round 50 cents, hauling included. In connection with mine is a store, and men deal there largely in winter months, often getting behind hand. Do not lose much, and sometimes limit supplies, as ordinary dealers. Generally speaking men are

sober, and one of the greatest boons would be to prevent the sale of liquor in the district. Company is assessed \$400 for school taxes this year. Flour "Dandy" brand, at store, \$6; same all winter. In summer it was \$6.25. Tea, 35 cents per lb; sugar, 8 to 10; molasses, 50 cents Imperial gallon; butter (small quantities), 22 cents. Has bought butter for 23 cents cash, and sold it for 26 cents to accommodate men. Does not mean to say never had more profit than that. Average price of potatoes 45 cents to 50 cents a bushel. Oatmeal, \$6 in winter. Flour and meal cheaper now than this time last year, or ever before. Running store is not philanthropic, and has not doubt some stores sell some things cheaper.

Caledonia Colliery, Glace Bay. From Workman's standpoint:—

About 160 men employed, perhaps 20 boys; average laborers, about 25. Men are their own masters and come up when they like. Ready with tools at 6 a.m., but may be 7 before they get down; he comes up from 2.30 to 5.30 or 6; works about eight months of twenty-two days in the year; during the other four months does nothing. Thinks ten tons a good day's work for one pair of men. Shovels at 33 cents per ton in summer and 28 cents a cubic yard in banking season. In June, 1887, gross earnings \$29.75: deducted for powder and oil, \$2.84; sundries, \$1.90; store, \$20.23; weighman, 35 cents; cash advanced, \$5; balance, \$4.18. Is paid fortnightly, and some times gets money between times. Thinks store belongs to manager. Clerk told him it was optional to deal at store, but when he got work it was on the understanding that he would take goods during banking season. In spring men get flour, tea, oatmeal and molasses from store. Is married and does not live in company's house; cannot get as good a house from other persons as from company; their rents lower. Mr. McKeen told him only men who had claims on him were those who lived in his houses. He looked at one and found the well about 40 or 50 feet from stables; rent \$1.50 a month. No cellar

but a hole in the floor about 18 inches deep; no drain; tenants had been quarantined with diphtheria for four weeks. No more than a day or two's notice required on leaving; gets due bill for amount of wages. Single man pays 50 cents a month for doctor. Is married man with family, and does not pay doctor's fee, as he did not attend him when he met with an accident, as he lived a mile from colliery; believes he is not the only one who does not pay. Does not pay school taxes, because he is a ratepayer, others pay 15 cents; men who pay school tax pay \$1 poll and county taxes—that is the law. Youngest children working in mine, nine and ten, generally trappers. Fine of \$5 for plugging coal instead of picking. Paid monthly; think it a disadvantage; one-third is kept back, so have to wait a month and a-half for pay when first taken on. Being so paid only store to deal at, and pays higher than at other stores for cash: flour, \$6.25 a barrel—cash, \$5.50; tea, 35 cts. and 22 cents to 30 cts. a pound; sugar, 9cts. and 8cts. a pound; soap, 7 and 8 cts. a pound—same quality in cash store 5 cts.; molasses, 50 cts. and 40 cts. a gallon; butter, 22 cts., sometimes 26 cts. a pound—from countrymen or stores average 20 cts. a pound, of as good quality as company's store; potatoes 80 cts. a bushel, and for cash 40 to 45 cts. Men have to buy at company's store, having so long to wait for money. In case of sickness or disablement relief is got out of association or out of miners pockets; has known of the manager contributing once. Doctor attending straight through child-birth, \$4; manager appoints doctor. Flour in company's store, \$6.25 manager says it is only \$6 (produces clerk's handwriting.) In 1886 flour at company's store cost \$3.33 for half barrel every month; in 1887 it cost \$6.75 at one time and \$6.50 at another for barrel. Has seen men paid as low as 40cts. a day, going on 18 years old. Does not think he would have to pay any taxes. Knows a man of 21 working overground who gets 60cts. a day. Would like to urge difference of prices of company's store and cash store, and necessity of weekly payments. Men who pay \$3.10 to company have



no say in school business, while he who pays less, because a rate-payer has a vote; a miner is a trustee. Objects to pay 15 cents a month to company because they have no claim to collect it. Miners buy the books. Estimate a miner, his wife and four children could live as follows:  $\frac{1}{2}$  barrel of flour a month;  $\frac{1}{4}$  of a barrel of oatmeal; for tea and coffee I allow \$1; for 15 pounds of butter a month, at 20 cents a pound, \$3; 15 pounds of cheese at 15 cents a pound, \$2.25; 3 pounds of meat a day, that costs us about 7 cents a pound all through. Sometimes we can buy it for 4 cents and sometimes it is 14 cents. That would cost \$6.20; 3 bushels of potatoes at 40 cents a bushel would be \$1.20 a month. For peas, beans, rice and turnips, I allow 50 cents; a gallon of molasses would be 40 cents, and 8 pounds of sugar, \$1.04. For fish I allow 30 cents a month. One quart of milk a day would be \$2 a month. For wear and tear of furniture I allow \$1. Rent and coal would cost \$3.50 a month on an average. The doctor and school would be 35 cents for a man of family. Now, for a man of family you must allow something for societies; I put that at 60 cents. For statute labor we pay \$1 a year, that would be a little over 8 cents a month. The poll tax and county tax would be 11 cents a month. The clergyman would cost 50 cents a month if we did it right. I do not take in clothing. I make it altogether \$27.27 cents a month, and I do not believe a family can be supported under that amount. Our income is a good deal under that in a year..

Reserve Colliery, from mine owners standpoint:

From 150 to 250 men and boys are employed, according to busy time of year; about ninety cutters; thirty-seven boys; laborers, fifteen below and eighteen on the surface. Laborers get 90 cents to \$1 and \$1.10, reduced 10 cents in winter; same hours winter and summer; slight difference in pay of those working below. A boy going as trapper gets 35 cents as a rule, but gets more when a driver. Drivers get 80 cents a day; cutters 38 cents a ton in summer for riddled coal and 32 cents in winter for unriddled

coal. If checker thinks too much slack is being sent up one-fifth of a tub is fined. Fines pretty frequent. Miners' time would aggregate 200 days all round, and average earnings \$1.90 a day gross; gross amount per day of deductions, about 15 cents. Men provide lamps company sharpens and supplies all tools. Men walk up and down slope, not allowed to ride; slope is 1200 feet at longest side and 800 or 900 on the other; not very steep; no stairs; never contemplated necessity of carrying men up and down. Pay men once a month and small sums in advance. Company keeps no store and supplies no goods to men, and there is no store in which manager or any official is interested. They can trade where they like; company accepts orders from stores if money coming to cover them, and stop it from the men and pay it to the store. Company own houses and rent at \$1 to \$1.25; two rooms on ground floor for \$1.25, kept in good repair. Forty cents a month deducted from pay for schools from married men, 25 cents single men, all the year round; company collects for schooling of men's children, provides school buildings and pays no school taxes in district. Pays county rate, \$800 or \$900, and thinks property assessed at \$75,000. No notice given or required on dismissal or leaving, and men paid in full by a due bill next day. Three or four men own houses. No provident fund for injuries; suggested one three or four years ago, but nothing was done. Would be considerable inconvenience to pay fortnightly; would not be an advantage to men. There are two stores at the Reserve Mine. Had stoppage at mine last year for increase of wages for cutters, but men resumed work without getting it. Has always been able to settle with men himself. Takes boys at thirteen years; usually ask their age; parents generally ask for the work. Those living in company's houses get the first show for work. Men generally sober. If the collieries were connected by rail with Louisburg, which is a winter port, coal could be shipped at the idle time of the year. The new railway ends at Sydney, thirty-three miles from Louisburg. There are ten miles of a three-foot gauge rail-



way in operation between the two places, and passing within a few miles of the chief collieries, which at little cost could be made a first-class road. Harbor is sometimes closed by drift ice, but not so as to impede the shipment of coal. More coal could be shipped and miners more constantly employed at better wages.

Bridgeport Colliery. From workman's standpoint:

Last winter he got, in one part of pit, 38 cents a ton; in another, 41 cents; and another, 43 cents per ton, regulated by height of the coal. For school tax 30 cents a month is stopped, idle time included. The Company pays \$1 poll tax for those liable—over 21 and under 60. After paying poll-tax company has \$2.60 taken as a school-tax. Has to pay poor and county rates as well. Boys in mine pay 60 cents a month for doctor and school. A man with two boys would pay \$15.80 for doctor and school in seven months. Lying-in charge, \$4. Is married and lives in his own house, paid for principally out of earnings. Cannot say if matter of taxes was presented to present agent, but was to his predecessor. Belongs to local branch of Workman's Association. Is paid monthly. Highest wages received during past twelve months about \$60 per month; lowest \$4; some months nothing. Works nine or ten hours a day, before 7 a. m. until between 4 and 5 p. m., and takes breakfast and dinner in pit. With fair play could send up from 4 to 4½ tons a day. Two men work together. Has not heard complaints from men being checked for bad coal. Company's man and men's weighman come to arrangement. Men come out by stairs, but could get out through the slope. They frequently ride up the coal shaft, preferring that way, as it is so much easier. Fortnightly pay would be an advantage, and would give men a better chance to deal for cash and buy cheaper. Not many own houses; he does not, but some men own farms, not bought out of their earnings and not from company. There are fines for plugging, for "fast shots," and for overcutting a chamber 1 cent a ton. When leaving, no regulation as to notice. Thinks there should be a law giving



miners and employees a first lien on rolling stock for wages. Pays 25 cents a load for coal-slack, company hauling; for round coal, 40 cents. Last winter got it for 35 cents. All employees get it at same rate.

Sydney Mines. From mine owner's standpoint:

Employs 604 men and boys. Underground, 284 men and 162 boys; on the surface, 132 men and 26 boys. Boys under twelve not allowed to work underground. Company has a store, but men are free to deal where they like; half do not deal at it. Men are paid monthly. Company owns 290 houses; which cost about \$450 each—rent from 50 cents to \$2.50 a month; some large ones fetch \$2.55—two stories, of seven rooms. Old houses have only lofts up-stairs. Wages of fair man, \$434.70; some have money in savings bank and some have built houses. Company has sold ninety acres of land at \$16 an acre. Some pay \$4 a year for the land they have built on. Company would only take back land for mining purposes. Trappers get 50 cents a day; drivers from 50 to 85 cents. This year Company commenced giving \$20 a month to family society. Company pays taxes: Town of North Sydney, \$491.40; in own district, county rates, \$4,468.80 school rates, \$1,596; statute labor, \$158.45; total, 6,714.65. In 1876 men struck for an advance and returned without it. Has been an increase in wages once or twice since. A decrease in 1884, but are a little better than in 1876. Does not believe in compulsory arbitration, as passed by Local Legislature. Cause of 1884 strike, reduction of wages on account of price of coal. Some drink; others don't, and the law should be that no rum should be sold within two miles of mines. Steamers have precedence in loading; if sailing vessel is half loaded, must move for steamer. Miners get coal free; charge for hauling only. They used last year 5,800 tons. Charge a little over cost for picks, and nothing for sharpening. Ten schools at mines: average attendance, 490 children. Does not think it would be an advantage to pay fortnightly. Sober men do not wish it, and would entail double labor to make

out pay roll. If a man asks for an advance he gets it. No fines, except when pit-drivers go to 17 feet or more, then a fine of 1 cent a ton. If a horse is killed boy in fault pays half value. Engine-drivers work twelve hours. Takes an hour and a half to take men up and down; time not lost. Doctor's fees: Married man with family, 40 cents a month; single man, 25 cents; each son pays after sixteen. (See memorandum of wages, &c.). Since 1876 the price, as fixed by mutual agreement, has been, in summer, 43 cents a ton for large coal and nothing for slack; and in winter 33 cents for large coal and 15 cents for slack. Slack is whatever passes through a screen  $\frac{3}{4}$ th of an inch opening. About 20 per cent. goes through. No law exists under which a man injured, through no fault of his own, can claim to be provided for. Only precaution required by law is the providing of man-holes at every 20 yards. A store has been kept by the company since 1878 or 1879, object being to prevent the great increase in the price of flour which annually took place in the spring, when country merchants' stocks began to run short. Spring price of flour was in this way reduced \$2, and hundreds of country people bought their supplies from the store. Other goods, besides flour, are now kept, and sold at fair prices; but the miners can please themselves as to dealing at the company's store or elsewhere. In winter company's store, and all merchants, trust men with goods until spring.

*Statistics of Sydney Mines, 1887.*

MONTH.	Number of Colliers.	Days Cutting Coal.	Days at Shiftwork.	Total Days Worked.	Amount.
					\$ c
January.....	212	3314	81 1/2	3395 1/2	4121 60
February ....	213	1826 1/2	67 1/2	1894	2419 77
March .....	216	4196 1/2	40 3/4	4237 1/4	5070 78
April .....	220	2286 1/4	225	2511 1/4	3332 71
May.....	218	5093	168 1/2	5261 1/2	7994 99
June .....	229	4934 1/2	205 3/4	5140 1/4	7941 12
July.....	230	5120 1/2	160 1/2	5281	8289 82
August .....	228	5023	232	5255	7855 98
September ....	218	4848	272 1/2	5120 1/2	7899 38
October.....	217	4801	217 1/4	5018 1/4	7790 10
November ....	217	4093 1/2	125 1/2	4219	6570 79
December .....	204	1414 3/4	80 1/2	1495 1/4	2490 99
.....		4695 1/2	1877 1/4	48828 3/4	\$72178 03

An increase in the Government coal royalties to 10 cents per ton did not overburden the industry as the operators feared, and between 1888 and 1892, inclusive, four collieries south of Sydney harbor, viz: The Gowrie, Little Glace Bay, Caledonia and International, made an average profit of about 40 cents per ton on their output, exclusive of the profits from the colliery stores, revenue from railways, outside of coal traffic, and "profits of the steamship Co.," "Black Diamond."

On the north side of Sydney Harbor, the dividends of Sydney Mines, during the same period increased from 3 1-2 per cent in 1888 to 6 per cent. The collieries in operation in 1891 were:



NAME OF MINES.	Thickness of Seam.	Lights.	Lamps.
Sydney Mines .....	5 ft. 6 in.	Open Lights.	Common Fire Lamps.
Victoria Mines.....	6 " 8 "	" "	" "
Gardner Mines .....	4 " 4 "	" "	" "
Old Bridgeport Mines...	5 " 9 "	" "	" "
Reserve Mines.....	8 " 9 "	" "	" "
Emery Mines.....	4 " 9 "	" "	" "
International Mines.....	5 " 10 "	" "	" "
Little Glace Bay Mines..	5 " 10 "	" "	" "
Caledonia Mines.....	8 " 6 "	" "	" "
Ontario Mines .....	8 " 4 "	" "	" "
Gowrie Mines .....	5 " 8 "	" "	" "

Three of the most important, viz: Gowrie, Caledonia and Little Glace Bay were not, however, connected by rail with Sydney Harbor, and the only winter port continued to be Morien, the port of Gowrie Colliery. Although coal cutting machinery was being gradually introduced (1891-2), coal was still shipped, transported and discharged in a relatively expensive fashion; and the united efforts of the Cape Breton mine owners scarcely produced annually 1,000,000 tons of coal.

Their coal was distributed in the following markets in A. D. 1892:

*Distribution of Nova Scotian Coal in 1892*

	FROM CUMBERLAND COUNTY.			FROM PICTOU COUNTY.			FROM CAPE BRETON COUNTY.			FROM OTHER COUNTIES.			TOTALS.			GRAND TOTAL.
	Round.	Slack.	Run of Mine.	Round.	Slack.	Run of Mine.	Round.	Slack.	Run of Mine.	Round.	Slack.	Run of Mine.	Round.	Slack.	Run of Mine.	
NOVA SCOTIA :	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Land Sales ...	45,487	72,528	3,330	114,478	104,461	.....	6,718	1,740	.....	386	.....	.....	167,069	178,729	3,330	349,128
Sea borne.....	3,723	1,653	.....	33,055	3,551	.....	161,422	35,836	34,404	206	.....	.....	199,406	41,040	34,404	274,850
Total, N. S.....	49,210	74,181	3,330	148,533	108,012	.....	168,140	37,576	34,404	592	.....	.....	366,475	219,769	37,734	623,978
New Brunswick....	69,049	24,072	50,853	19,460	4,897	.....	41,463	3,819	937	.....	.....	.....	129,972	32,788	51,790	214,550
Newfoundland .....	.....	.....	.....	.....	.....	.....	90,441	2,891	1,697	.....	.....	.....	90,411	2,891	1,697	94,999
P. E. Island.....	.....	.....	.....	8,220	19,001	.....	16,898	11,896	254	369	.....	.....	25,487	30,897	254	56,638
Quebec.....	31,143	16,481	95,560	88,223	9,111	.....	416,730	83,545	5,244	.....	.....	.....	536,066	109,137	100,804	746,037
West Indies .....	.....	.....	.....	.....	.....	.....	2,849	.....	.....	.....	.....	.....	2,849	.....	.....	2,849
United States .....	.....	8,768	.....	.....	.....	.....	2,135	2,980	.....	.....	.....	.....	2,135	11,748	.....	13,883
	149,402	123,502	149,743	264,436	141,021	.....	738,626	142,707	42,546	961	.....	.....	1,153,425	407,230	192,279	1,752,834

The convenient position of the Sydney coal field for the prosecution of a water borne coal trade had, however, been fully demonstrated by the preponderance of its exports to the Province of Quebec, vide following table:—

*Table of Nova Scotian Coal Exported to Province of Quebec.*

TONS.

Year.	From Pictou.	From Cumberland.	From Cape Breton.
1873	106,816	.....	80,213
4	116,188	.....	46,081
5	148,151	.....	41,603
6	85,126	.....	32,177
7	64,997	.....	30,121
8	55,502	.....	28,208
9	103,217	8,844	42,057
1880	141,487	33,497	64,107
1	83,437	35,448	149,643
2	125,521	58,561	198,892
3	145,527	46,483	218,595
4	139,934	104,243	152,605
5	115,363	163,300	215,254
6	95,499	188,935	254,328
7	95,310	202,121	353,427
8	114,382	182,927	381,012
9	73,461	177,461	381,074
1890	90,461	181,008	480,462
1	63,319	183,573	528,394
2	97,334	143,184	505,519



The following prices of Nova Scotian coal at and water rates of freight to St. Lawrence ports during most of the above period have been furnished to the author :

*Prices of Coal delivered from The Nova Scotian Mines at St. Lawrence Ports, and Rates of Freight at which same was transported 1876 to 1893 inclusive.*

Year.	Price of Coal.	Rate of Freight.
1876	\$4.12 to \$4.50	\$2.00
7	4.00 to 4.10	1.90
8	3.95	1.80
9	3.90	1.70
1880	3.80	1.60
1	3.70	1.50
2	3.60	1.50
3	3.50	1.40
4	3.50	1.40
5	3.40	1.30
6	3.40	1.30
7	3.30	1.25
8	3.30	1.25
9	3.40	1.25
1890	3.30	1.20
1	3.20	1.20
2	3.20	1.15
3	3.20	1.10

The contribution of each colliery in the Sydney coal field to the water borne division of the Quebec trade, as far as ascertainable, during 1891-1892 appears in the following table; also, for comparison, that of the collieries in the Pictou coal field; the exports from the Cumberland Field to Quebec being presumably all rail borne:

*Comparative Statement of Coal Deliveries to St. Lawrence Ports, for the years 1891 and 1892.*

NAME OF COLLIERY.	MONTREAL.		SOREL.		THREE RIVERS.		QUEBEC.		TOTALS.	
	1891	1892	1891	1892	1891	1892	1891	1892	1891	1892
CAPE BRETON:										
General Mining Association..	40,819	75,547	26,840	2,589	4,173	9,012	24,011	30,472	95,843	116,620
Reserve .....	84,082	74,326	8,317	4,358	4,300	.....	11,212	9,419	107,911	88,103
International .....	103,969	77,758	.....	283	.....	.....	4,954	7,620	108,923	86,611
Caledonia.....	69,317	73,225	18,764	.....	.....	.....	940	.....	89,021	73,225
Gowrie .....	58,200	68,198	1,806	1,845	.....	.....	2,599	3,293	62,605	73,336
Glace Bay.....	53,324	43,676	.....	.....	.....	.....	412	1,723	53,736	45,399
Gardiner .....	.....	.....	.....	.....	.....	.....	.....	5,521	.....	5,521
PICOU:										
Intercolonial.....	40,420	79,155	.....	4,566	.....	.....	276	.....	40,697	83,721
Vale and Acadia .....	4,193	.....	.....	.....	.....	.....	.....	.....	4,193	.....
FOREIGN:										
Scotch.....	15,193	23,236	.....	8,103	.....	.....	11,078	12,395	26,271	38,734
English.....	5,282	6,190	.....	.....	.....	.....	7,844	5,177	13,126	11,367
American Bituminous.....	.....	3,450	.....	.....	.....	.....	.....	.....	.....	3,450
	474,799	542,761	55,727	15,694	8,473	9,012	63,326	75,620	602,325	626,087

Such was the condition of the natural source of coal supply for maritime New England and Eastern Canada, and the logical site for some of the principal manufacturing centres of the western hemisphere, when Mr. Henry M. Whitney, of Boston, Mass., and Mr., now the Hon. B. F. Pearson, K. C., and their associates united the Gowrie, Blockhouse, Schooner Pond, Clyde (Ontario), Glace Bay, Caledonia, Reserve, Lorway, Emery, International, Old Bridgeport, Gardiner, Lingan, Victoria and some contiguous submarine properties into the Dominion Coal Company in 1893-4.

The amalgamation of these properties was regarded with some disfavor in Nova Scotia, as tending to check private mining enterprise and, in part, to re-establish that monopoly of the provincial coal trade, which had been abolished in A. D. 1858, after a long diplomatic struggle with the Crown; but the project was consummated through the support of the Hon. W. S. Fielding, who safe guarded the provincial revenues by the imposition upon the combine of a fixed minimum annual royalty, and royalties at the rate of 12 1-2 cents per ton during the ensuing 99 years. The usefulness of the merger company's coal was carefully tested, and in 1894 samples were analyzed in Germany for bye-products, with the following results:

	Coarse Pieces.	Fine Pieces.
Gas, cubic meters per 1000 Kilogram (2205 lbs.) (equals 11,117 cu. ft.)...	317.7	314.6
Coke, per cent.....	65.08	66.5
Tar, per cent.....	4.4 to 5.6	3.5 to 4.5
Ammonia, per cent.....	.2757	.2241
Sulphate of Ammonia per 1000 Kil. ....	11.35	9.22

The Sulphate of Ammonia in the fine pieces is equal to 0.922 per cent. or 20¾ lbs.; in the coarse pieces 1,135 per cent., or 25 lbs. The formation of tar differed very much from the coals of the Westphalian coking fields.



The Dominion Coal Company to provide a second winter outlet extended the International Mines railway via the existing ice-free port of Morien, to Louisburg. The thinner seamed, Gardiner, Emery, Gowrie and Stirling collieries were, however, closed A.D. 1893 to 1898; Old Bridgeport colliery, to increase the available coal for the other contiguous winnings, in 1898; Victoria colliery in the same year, and, in 1899, the Hub, which had been extended 1400 feet under the Atlantic.

Mechanical coal cutting was adopted, to the almost total exclusion of hand picks endless haulage was introduced at the Reserve Mine in 1893; the most modern mining machinery and conveniences were installed; larger coal waggons and colliers were employed; rapid discharging plants were erected at Montreal, and, later, elsewhere; Dominion No. 1 shaft 24 feet long by 10 feet 6 inches wide, was sunk in the Phalan on the Old Bridgeport area, at a cost of \$39.39 per foot in 1894, and Dominion No. 2 colliery, to the Harbor and Phalan seams in 1900-1901. Electric underground haulage was introduced in 1901 and compressed air locomotives in A. D. 1903; and, after the author demonstrated the accessibility of the undersea coal at Morien, submarine mining systematically commenced, at the Hub Colliery, in 1904, in the Harbor seam, Dominion No. 2 mine in 1904, at Dominion No. 1 in 1905, and at Caledonia colliery, in A. D. 1906.

Dominion No. 6 mine was opened on the Phalan seam at Big Glace Bay in 1904, and the works were connected, along the old roadbed of the Schooner Pond. Reserve Railway, with the Sydney and Louisburg system; the stone drift between the Phalan and Emery seams at Reserve mine was re-opened in 1905; other openings have been made in the Glace Bay Basin, on the Phalan seam, and the company is re-establishing the coal industry in the Lingan district.

The following table records the production of the Dominion Coal Company, Limited, during the fiscal years of the Nova Scotia Government, those for 1893 covering 9 months only:

Year.	Production Tons.	Labor Employed Men and Boys.
1893	652,833	1797
4	950,683	2211
5	905,671	2572
6	1,079,198	2750
7	1,252,484	2108
8	1,155,311	1116
9	1,454,203	2202
1900	1,930,425	3109
1	2,352,567	3475
2	2,952,578	3454
3	3,283,117	4791
4	3,117,648	4917
5	3,076,107	4139
6	3,603,985	4893
7	3,456,937	5216
8	3,816,958	5486
	35,040,625	

The Sydney and Louisburg Railway connects the Company with the Intercolonial (Government) railway, with a pier in Sydney harbor, one at Louisburg, and with the plant of the Dominion Iron and Steel Company.

The piers can take very large steamers, load through shoots at any tide, and are provided with appliances for loading without breakage, etc. The Louisburg pier has conveying belts from large pockets capable of loading in addition to the regular pier work over 600 tons per hour.

The following table, showing the earnings of representative workmen at the Dominion Coal Company's collieries during the years 1897 and 1900, represent the standard of wages in the Sydney Coal field at that time:

Statement showing earnings of representative workmen, selected from various classes, during the years 1897 and 1900:

	International Colliery		Caledonia Colliery		Reserve Colliery		Dominion No. 1 Colliery	
	1897	1900	1897	1900	1897	1900	1897	1900
<b>Hand Cutters</b> 1..	\$495 13	\$900 10	\$377 31	\$ 565 33	\$506 88	\$847 84	.....	.....
2..	480 49	881 04	457 34	670 01	490 85	934 32	.....	.....
3..	462 23	919 46	455 76	639 93	483 25	641 53	.....	.....
4..	422 81	769 30	475 19	639 25	476 32	740 74	.....	.....
5..	418 25	933 73	.....	.....	441 51	735 97	.....	.....
6..	383 81	907 70	.....	.....	445 17	720 54	.....	.....
7..	366 26	715 44	.....	.....	444 66	714 58	.....	.....
<b>Average per man</b> .	432 71	860 97	441 40	628 63	469 81	762 22	.....	.....
<b>Machine Cutters</b> 1	.....	.....	534 68	955 34	460 91	931 84	\$832 95	\$1157 04
2	.....	.....	583 03	1075 93	.....	.....	758 94	1002 66
3	.....	.....	637 70	871 98	.....	.....	615 59	900 52
4	.....	.....	689 65	1240 97	.....	.....	583 29	922 08
5	.....	.....	709 77	1022 26	.....	.....	558 15	924 22
6	.....	.....	.....	.....	.....	.....	544 07	843 32
7	.....	.....	.....	.....	.....	.....	501 87	805 86
<b>Average per man</b> .	.....	.....	630 97	1033 29	.....	.....	627 84	936 53
<b>Drivers</b> 1.....	153 42	421 15	207 91	380 88	231 34	360 33	274 32	402 31
2	132 37	387 36	200 45	351 47	228 86	341 50	255 25	392 25
3.....	127 24	369 79	175 51	342 98	218 52	326 77	252 68	351 00
4.....	126 61	317 61	154 15	312 99	188 72	308 51	226 62	349 95
5	123 16	309 06	.....	.....	.....	.....	.....	.....
6	98 43	261 97	.....	.....	.....	.....	.....	.....
<b>Average per man</b> .	126 87	344 49	184 50	347 08	216 86	334 28	252 22	373 88
<b>Landing Tenders</b> 1	242 58	405 43	286 74	340 43	366 85	602 64	338 37	493 86
2	223 32	378 81	250 30	337 12	324 34	485 50	312 60	478 54
3	198 20	325 84	240 42	331 88	275 46	441 43	227 72	470 76
4	186 30	319 10	233 80	258 48	234 55	361 58	223 27	402 79
5	177 18	295 01	.....	.....	.....	.....	.....	.....
<b>Average per man</b> .	205 52	344 84	252 81	316 98	300 30	472 79	275 49	461 49
<b>Blacksmiths</b> 1.....	444 90	492 92	480 00	624 87	405 33	593 15	484 81	552 02
2....	340 89	431 92	414 05	509 03	406 81	450 22	385 44	542 33
3.....	225 85	411 40	327 88	498 00	.....	.....	234 21	510 31
<b>Average per man</b> .	337 21	445 41	407 31	543 97	406 07	521 68	401 49	534 89
<b>Carpenters</b> 1.....	267 00	475 85	477 68	581 69	413 70	597 21	403 23	526 35
2.....	243 84	470 02	384 17	572 80	326 83	411 28	380 96	437 09
3.....	239 30	402 20	287 59	529 34	.....	.....	333 26	416 77
<b>Average per man</b> .	250 05	449 35	383 15	561 28	370 26	504 25	372 48	460 07
<b>Engine Drivers</b> 1	480 00	738 11	440 00	560 13	323 96	421 86	480 00	581 03
2	313 14	400 33	408 63	532 78	269 91	349 46	418 60	533 70
<b>Average per man</b> .	396 57	569 22	424 31	546 45	296 94	385 66	499 30	557 36



	International Colliery		Caledonia Colliery		Reserve Colliery		Dominion No. 1 Colliery	
	1897	1900	1897	1900	1897	1900	1897	1900
Firemen 1 .....	\$460 00	\$540 10	\$476 64	\$523 41	\$391 60	\$595 94	\$385 49	\$600 95
2 .....	339 09	496 76	336 69	496 12	401 50	591 18	349 82	524 47
Average per man	399 55	518 43	406 66	509 76	396 55	593 56	367 65	562 71
Laborers 1 .....	344 10	484 74	326 79	421 12	293 30	390 48	327 59	435 21
2 .....	232 80	403 04	278 90	407 36	288 50	369 04	322 60	367 22
3 .....	216 10	349 55	265 80	375 38	.....	.....	299 40	349 55
4 .....	214 40	327 95	264 40	356 23	.....	.....	266 47	327 85
Average per man	251 85	391 32	283 97	390 02	290 85	379 76	304 01	369 96
Loaders 1 .....	.....	.....	206 92	408 54	.....	.....	336 54	485 98
2 .....	.....	.....	206 91	328 80	.....	.....	274 82	469 45
3 .....	.....	.....	193 88	309 89	.....	.....	265 77	461 11
4 .....	.....	.....	185 92	258 85	.....	.....	.....	.....
Average per man	.....	.....	198 41	326 52	.....	.....	292 38	472 18

The wages earned annually by employees of Dominion Coal Company, to Feb. 28, 1901, were:

March 1, 1893, to February 28th, 1894.....	\$ 741,527 11
“ 4, “ 5.....	1,103,413 77
“ 5, “ 6.....	978,295 48
“ 6, “ 7.....	988,774 92
“ 7, “ 8.....	999,967 13
“ 8, “ 9.....	989,000 24
“ 9, “ 1900.....	1,333,859 75
“ 1900, “ 1901.....	2,187,437 65
Total earnings.....	\$9,322,276 05

The expenditures by the Dominion Coal Company, on betterments, construction, equipment, supplies, etc., in Cape Breton (exclusive of wages paid for winning coal) to February 28 1901, were approximately \$5,362,925.83.

The housing of the working classes has been generously improved by this important company.

The following census of the company's houses compiled in A. D. 1907, covered all the collieries, Glace Bay, Morien and the Sydney Pier:

"The total population of the company's houses is 10,584. Of these 1791 are tenants, 1326 boarders and 937 boys of 12 years or over, and 811 of the boys are working. There are 5,438 women and children. The number at the different collieries is as follows:

"1,244 at No. 1 colliery; 3,127 at No. 2; 990 at No. 3; 1045 at No. 4; 1,851 at No. 5; 688 at No. 6; 437 at No. 7; 525 at No. 8. and 679 in other places, Glace Bay, etc.

"Of the 1,791 tenants there are 196 at No. 1; 531 at No. 2; 165 at No. 3; 185 at No. 4; 270 at No. 5; 123 at No. 6; 83 at No. 7; 95 at No. 8; and 143 in other places.

"There are 1,000 houses occupied by miners, 5 boarding houses and 5 hotels, and 80 shacks. There are 22 shacks at No. 2, and 36 at Reserve. The shacks are principally occupied by foreigners, 85 per cent. of the houses are occupied by natives; 88 houses are occupied by widows; 100 new houses are being built at No. 2; 2,200 men and boys in the company's employ are living in houses not owned by the company."

The standard of wages at the collieries south of Sydney Harbor, between January 3, 1905, and January 3, 1908, was established in a three years' agreement entered into between the Dominion Coal Company, Limited, and the Provincial Workmen's Association, on December 30, 1904, viz:

\*"The employees shall not attempt to restrict the sale of coal of 'The company' to any person, firm or corporation. If the manager of any colliery of the Dominion Coal Company and a committee of the local lodge of the Provincial Workmen's Association of the employees of such colliery, are unable to agree on the interpretation of any of the terms and conditions of this agreement, or on any point of dispute, it shall be referred to the General Manager, or if the General Manager be absent, to the Acting General Manager, or some such officer of 'The Com-

\*From the State Papers of Canada.

pany.' During a dispute of this character all work shall be continued, pending a final settlement, but any adjustment shall date from the time of which notice in writing is given by the Secretary of the local lodge of the Provincial Workmen's Association to such manager.

The Employees will exercise the greatest possible care to produce coal in the best possible marketable form, and when in the judgment of the management shearing is necessary, the same will be adopted.

(a) Where shearing is adopted in machine cut work, the Company will provide efficient shearing machines, but no extra price will be paid on coal cut by machines, except in narrow work, in which case the rates shall be adjusted by the local committee and the manager of the mine or colliery.

(b) Rules will be adopted providing for the coal to be broken up with wedges, and other provisions made to ensure larger coal.

(c) The track must be kept near the coal, to avoid double handling.

In case stone, clay or other impurities are sent up with the coal, it shall be the duty of the Company's inspector at the bank-head to report the same, and the present system of docking and penalties will be enforced.

Rules, when agreed upon by the local committee and manager, will be adopted by the Company to provide for the imposition of penalties on men who are absent from their work without good cause, or the permission of the manager, or who leave their work before full working time is completed.

In case of a fatal accident in any mine, the district of the mine in which the accident occurred may be laid idle the day of the accident, but the mine shall not be laid idle by the men on any subsequent day, unless the number of men desiring to actually attend the funeral prevents its being worked on that day.



Any men who absent themselves without attending the funeral will be subject to the same penalties as men who absent themselves from work without good cause or permission.

If any employee is absent on whom depends getting out coal, such as driver, landing tender, etc., the officials shall fill his place for the day by an employee selected from the same section. On such occasions the rate paid by the Company shall be two dollars per day.

In selecting employees for the service above referred to the officials will take each one of the section in turn, and if the man selected be incapable of performing the service required, a substitute will be found, who will receive his average daily rate, and the man whose place he fills shall accept \$2 in making up the difference to the substitute. Men will be taken out in their own class.

When it is practicable, miners will be given a sufficient number of places to ensure full and steady work for every working day, and the Company agrees to give new, or vacant places, to men now working, until this clause is in full force. But if the quantity of coal got in any one week by any minor falls below the quantity of coal which should have been taken from the places assigned to him, except for reasons which the manager deems good and sufficient, the number of his working places will be reduced.

The Company will supply necessary tools to miners, shot-firers, loaders and others, when they start work.

Worn out or broken tools when returned to store, or to man in charge thereof, will be replaced free of charge, and picks and augers will be sharpened by the Company without charge.

Tools maliciously damaged or lost will be paid for by the workmen.

The Company will deliver machine picks at the landing nearest the face, and will endeavor to introduce some system by which picks may be delivered to the machine cutter at the face without

the use of pick boys, the men agreeing to co-operate in making such a system a success, but the machine man will only be responsible for picks while in his possession.

The Company will supply a short section of track for each working face, and coal contract men, at the face, will undertake to keep this piece of track up to the face. This piece of track will in no case be removed from the place for which it is intended.

Coal contract men will secure their working place as at present. If a miner is ordered to put up booms the following rates will be given :

14 ft. boom with two props, or prop and hitch, 40c.

9 ft. cap or boom, with 2 props, or prop and hitch, 25c.

These prices do not affect the narrow work, which remains as at present.

When it is considered necessary by the Company, open lights will be abolished, and safety lamps given to the men. The Company will make no charge for cleaning, filling and trimming the safety lamps, and will not make any allowance for this change.

The price of coal to employees at the mines and machine shops, and house rent to such employees, shall not be increased.

When colliery mechanics work overtime they will be paid time and a half on week days, and double time on Sundays, for the time so worked.

Rates for all pillars in the Phalen and Hub seams, except east side, Caledonia, are made uniform at 46 cents per ton.

Wages and rates for mining shall be as per attached schedule.

The scale of rates in the different classes of workmen in the machine shops shall remain as at the present, but men may be raised in their classes, or re-classed from time to time; and the committee of the workmen shall have the privilege of making representations to the manager when they consider it advisable.

## WAGE SCHEDULE THREE YEAR CONTRACT.

## DOMINION NO 1 MINE SCHEDULE OF RATES FOR MINING.

Machine cut coal : per ton of 2,240 lbs.

(Note.—“P” for power drill ; “H” for hand drill.)

Under-cutting, 9.5c.

Boring, hand drill, 2.6c.

Boring, power drill, 2. 1c.

Total shot firing : P. 10.5c. ; H. 11.0c.

Loading, 11.5c.

Total for rooms, P.31.5c. ;H.32.0c.

Deeps, 39.5c

Headways or slants, 36.3c.

Levels, 36.3c.

Per lineal yard in addition to room prices, cross-cuts, 12.5c.

Hand cut coal : rooms per ton of 2,240 lbs.

Pillars, 46c.

Rooms, 49c.

Cross-cuts : per lineal foot.

Up to 15 feet, 25.6c.

Over 15 feet, 33.0c.

Rates for the different classes of day wage men shall remain as they exist today.

Contracts for driving, landing, tracklaying, or any similar service now existing, may be cancelled by either party giving one month's notice, when existing day rates shall come into force.

New contracts for above services may be made by mutual agreement.

## DOMINION NO. 2 MINE SCHEDULE OF RATES FOR MINING.

Machine cut coal : per ton of 2,240 lbs.

(Note.—“P” for power drill ; “H” for hand drill.)

Under-cutting, 11.5c.



Total shot firing, P.10c.;H.10.5c.  
 Loading, 11.8c.  
 Total from rooms, P.33.3c.;H.33.8c.  
 Deeps, 40.5c.; 9 feet wide, 51.0c.  
 Headways or slants, 38.5c.;9feet wide .48.5c.  
 Levels, 37.5c.; 9ft. wide, 47.5c.  
 Per lineal yard addition to room prices, cross-cuts, 12.5c.  
 Hand cut coal: rooms per ton of 2,240 lbs.  
 Rooms, 49.0c.  
 Pillars, 46.0c.  
 Cross cuts: per lineal foot.  
 Up to 15 ft., 25.6c.  
 Over 15 ft., 33.0c.  
 Rates for the different classes of day wages, etc.  
 Contracts for driving, etc.  
 New contracts. etc.

#### DOMINION NO. 3 MINE SCHEDULE OF MINING RATES.

Machine cut coal: per ton of 2,240 lbs.  
 (Note—"P" for power drill; "H" for hand drill.)  
 Under-cutting, 12.1c  
 Total shot firing, 10.5c.  
 Loading, 12.1c.  
 Total for rooms, 34.7c.  
 Deeps, 43.7c.  
 Headways or slants, 39.4c.  
 Levels, 39.4c.  
 Per lineal yard in addition to room prices, cross-cuts, 12.5c.  
 Hand cut coal: rooms per ton of 2,240 lbs.  
 Rooms, 49.0c.  
 Pillars, 46.0c.  
 Cross-cuts: per lineal foot.  
 Up to 12ft., 32.4c.

Over 12ft., and up to 21 ft., 45.6c.

Over 21 ft., 50.0c.

Rates for the different classes of day wages, etc.

Contracts for driving, etc.

New contracts, etc.

#### DOMINION NO. 4 MINE (WEST) SCHEDULE OF RATES FOR MINING.

Machine cut coal: per ton of 2,240 lbs.

(Note—"P" for power drill; "H" for hand drill.)

Under-cutting, 12.1c.

Total shot firing, P. 9.5c.; H. 10.5c.

Loading, 12.1c.

Total for rooms, P. 33.7c.; H. 34.7c.

Deeps, 40.5c.

Headways or slants, 39.4c.

Per lineal yard in addition to room prices, cross-cuts, 12.5c.

Hand cut coal: rooms per ton of 2,240 lbs.

Rooms, 49.0c.

Pillars, 46.0c.

Cross-cuts: per lineal foot.

Up to 12ft., 32.4c.

Up to 20 ft., 45.6c.

Over 20 ft., and up to 30ft., 55.0c.

Rates for the different classes of day wages, etc.

Contracts for driving, etc.

New contracts, etc.

#### DOMINION NO. 4 MINE (EAST) SCHEDULE OF RATES FOR MINING.

Machine cut coal: per ton of 2,240 lbs.

(Note—"P" for power drill; "H" for hand drill.)

Under-cutting, 13.5c.

Total shot firing, P. 10.5c.; H. 11.5c.

Headways or slants, 40.7c.

Deeps, 46.0c.  
Levels, 42.7c.  
Loading, 13.0c.  
Total for rooms, P.37.0c.;H.38.0c.  
Per lineal yard in addition to room prices, cross-cuts, 12.5c.  
Hand cut coal: rooms per ton of 2,240 lbs.  
Rooms, 51.5c.  
Pillars, 48.5c.  
Cross-cuts: per lineal foot.  
Up to 12ft., 32.4c.  
Up to 20 ft., 45.6c.  
Over 20 and up to 30 ft., 55.0c.  
Over 30 ft., 74.2c.  
Rates for the different classes of day wages, etc.  
Contracts for driving, etc.  
New contracts, etc.

#### DOMINION NO. 5 MINE SCHEDULE OF MINING RATES

Machine cut coal: per ton of 2,240 lbs.  
(Note—"P" for power drill, "H" for hand drill.)  
Under-cutting, 10c.  
Total shot firing, P.8.4c.;H.10.5c.  
Loading, 11.5c.  
Total for rooms, P.29.9c.;H.32.0c.  
Deeps, 39.5c.  
Headways or slants, 34.2c.  
Levels, 34.2c.  
Per lineal yard in addition to room prices, cross-cuts, 12.5c.  
Hand cut coal: rooms per ton of 2,240lbs.  
Rooms, 49.03c.  
Pillars, 46.0c.  
Cross-cuts: per lineal foot.  
Up to 15 feet, 25.6c.



Over 15ft, 33.0c.

Rates for the different classes of day wages, etc.

Contracts for driving, etc.

New contracts, etc.

#### DOMINION NO. 7 MINE SCHEDULE OF RATES FOR MINING.

Machine cut coal: per ton of 2,240 lbs.

(Note—"P" for power drill; "H" for hand drill.)

Under-cutting, 9.5c.

Total shot firing, P.10.5c.; H.11.0c.

Loading, 11.5c.

Total for rooms, P. 31.5c.; H.32.0c.

Deeps, 39.5c.

Headways or slants, 36.3c.

Levels, 36.3c.

Per lineal yard in addition to room prices, cross-cuts, 12.5c.

Hand cut coal: rooms per ton of 2, 240 lbs.

Rooms, 49.0c.

Pillars, 46.0c.

Cross-cuts: per lineal foot.

Up to 15 ft., 27.5c.

Over 15 ft., 73.3c.

Rates for different classes of day wages, etc.

Contracts for driving, etc.

New contracts, etc.

#### DOMINION NO. 8 MINE SCHEDULE OF RATES FOR MINING

Hand cut coal: total for rooms.

5 ft. to 5.6, per ton, 52.8c.

5 ft. 7 to 6, per ton, 50.6c.

6 ft. 1 and over, per ton, 47.3c.

Per lineal foot in addition to room prices:

5 to 5.6, 66.0c.

5·7 to 6, 66.0c.

6·1 and over, 66.0c.

Headways and slants :

5 to 5·6, 33.0c.

5·7 to 6, 33.0c.

6·1 and over, 33.0c.

Levels :

5 to 5·6, 37.0c.

5·7 to 6, 37.0c.

6·1 and over, 37.0c.

Pillars :

5 to 5·6, per ton, 47.3c.

5·7 to 6, per ton, 47.3c.

6·1 and over, per ton, 47.3c.

Cross-cuts : per lineal foot.

Up to 20 feet, 27.0c.

Over 20 feet, 33.0c.

Rates for different classes of day wages, etc,

Contracts for driving, etc.

New contracts, etc.

#### DOMINION NO. 9 MINE SCHEDULE OF RATES FOR MINING

Machine cut coal : per ton of 2,240 lbs.

Under-cutting 5 to 5·6, 14.5c; 5·7 to 6, 13.5c; and over, 12.5c.

Total shot firing, 5 to 5·6, P. 12.0c., H. 12.5c.; 5·7 to 6, P. 11.0c., H. 11.5c.; 6·1 and over, P. 10.0c., H. 10.5c.

Loading, 5 to 5·6, 14.5c.; 5·7 to 6, 13.5c.; 6·1 and over, 12.5c.

Total for rooms, 5 to 5·6, P. 41.0c.; H. 41.5c.; 5·7 to 6, P. 38c.; H. 38.5c.; 6·1 and over, P. 35.0c.; H. 35.5c.

Deeps, 5 to 5·6, 52.5c.; 5·7 to 6, 49.5c; 6·1 and over, 46.5c.

Headways or slants, 5 to 5·6, 50.5c.; 5·7 to 6, 47.5c.; 6·1 and over, 44.5c.

Levels, 5 to 5·6, 49.5c.; 5·7 to 6, 46.5c.; 6·1 and over, 43.5c.

Per lineal yard in addition to room prices.

Cross-cuts, 5 to 5·6, 12.5c.; 5·7 to 6, 12.5c.; 6·1 and over, 12.5c.

Hand cut coal: per ton of 2,240 lbs.

Total for rooms:

5 to 5·6, 12 feet wide, 50.0c.

5·7 to 6, 12 feet wide, 48.0c.

6·1 and over, 12 feet wide, 45.0c.

Deeps:

5 to 5·6, 12 feet wide, 76.0c.

5·7 to 6, 12 feet wide, 72.0c.

6·1 and over, 12 feet wide, 67.0c.

5 to 5·6, 9 feet wide, 66.0c.

5·7 to 6, 9 feet wide, 63.0c.

6·1 and over, 9 feet wide, 62.0c.

Headways or slants:

5 to 5·6, 12 feet wide, 63.0c.

5·7 to 6, 12 feet wide, 60.0c.

6·1 and over, 12 feet wide, 56.0c.

5 to 5·6, 9 feet wide, 56.0c.

5·7 to 6, 9 feet wide, 60.0c.

6·1 and over, 9 feet wide, 58.0c.

Levels:

5 to 5·6, 12 feet wide, 62.0c.

5·7 to 6, 12 feet wide, 59.0c.

6·1 and over, 12 feet wide, 55.0c.

5 to 5·6, 9 feet wide, 56.0c.

5·7 to 6, 9 feet wide, 56.0c.

6·1 and over, 9 feet wide, 54.5c.

Pillars:

5 to 5·6, 12 feet wide, 48.0c.

5·7 to 6, 12 feet wide, 46.0c.

6·1 and over, 12 feet wide, 45.0c.



Cross-cuts: per lineal foot.

UP to 20 feet, 27.0c.

Over 20 feet, 33.0c.

Rates for the different classes of day wages, etc.

Contracts for driving, etc.

New contracts, etc.

The compressed air coal picks in operation at the company's mines are said to use about 100 cubic feet of free air per minute, and it is said an energetic miner can cut two rooms per shift. It is stated that an expert under-cutter, with one assistant has under-cut 3,200 tons of coal in one month, but 40 tons per shift per machine is said to be probably above the average.

The organization of the Dominion Coal Company has obviously very greatly benefited Nova Scotia; and all eastern Canada has similarly felt the beneficial effects of this timely amalgamation of the collieries south of Sydney Harbor.

Moreover, as the Author pointed out in his then personal organ, "The Glace Bay Gazette," in A. D. 1906, the increase in the demand for coal since 1898 could not have been successfully met by the old operators. None of them had the capital, the men, the appliances, the piers, transports or other conveniences to handle the increase in the demand for Nova Scotia coal; and a shortage, which would have abnormally increased the price of fuel to the Canadian consumer, must consequently have occurred, but for the formation of the Dominion Coal Company and the prompt expenditure by it of large sums of money to increase the capacity of the collieries. The effects of the creation of the Dominion Coal Company have been even more far-reaching. The internal economies of such an extensive industrial organization eventually compelled it to increase the coal markets tributary to it at home and abroad, and to-day its creation, The Dominion Iron and Steel Company, one of the largest coal consumers in Eastern Canada, is realizing the long cherished hope of Cape

Breton for local coal markets. This important Cape Breton manufacturing company, the pioneer of the national manufactories to be established on the island, was formed by the directors of the Dominion Coal Company, in 1899, and the following works have been erected upon 440 acres of land on Sydney Harbor, in connection with its operations. This land, valued at \$83,000, was presented to the company by the town of Sydney.

\*Four blast furnaces, standing on the harbor front; ten 50-ton open hearth furnaces, a 36" blooming mill and pit furnaces, a 28" rail mill, 1,000 tons capacity, a rod mill of over 7,000 tons capacity monthly, a continuous billet mill, 600 tons daily capacity, 500 Otto-Hoffman coke ovens, coalwashing, sulphuric-acid plants, and by-product plant, a large machine shop and foundry, a complete ore handling equipment, receiving and shipping piers, and other equipments of a complete plant.

The ore handling plant consists of a pier 1,100 feet long, upon which are placed five Hoover and Mason hoisting towers—capacity of each tower, 1,200 to 1,500 tons per twenty-four hours. Tracks extend from the pier, about 1,600 ft. to ore bins, which are provided with 3 tracks, with suitable cross-overs for the handling of coke, ore and limestone for the regular furnace supply, and for storage in the stockyards. These have ample capacity for the storage of six months supply of material, as well as for re-handling of stock for the winter operations of the blast furnaces. The stockyard has sufficient area to store a full supply of ore and limestone for four blast furnaces during the season of closed navigation. There are four large coke bins from which the coke is fed into the skip car, which takes it to the furnace. There are seven bins for each furnace, a total of twenty-eight.

The four funaces are each of 250 tons capacity; furnace stacks at the bosh are 85 ft. high; diameter of the hearth, 11 ft. 9 inches; at stock line, 14 feet, 6 inches. Each furnace is provided with Julian Kennedy's patent top filling apparatus. The furnace shell is 28 ft. diameter at the mantle, and 23 ft. at the top of the

\* Works description extracted from State Papers of Canada.

furnace. The bustle pipe surrounding the columns is 3 feet 6 in. in diameter. The twelve "tuyeres" are of an improved type, with ball joints and adjustable blow pipes. The stoves are of Cowper type, casting 21 ft. in diameter, by 85 feet high; chimneys 9 ft. in diameter inside the lining; 200 ft. high.

The boiler-house houses boilers aggregating 98,000 h. p., of the Babcock and Wilcox type. The engine house contains five pairs of blowing engines, built by E. P. Allis Co. The engines have each a high-pressure cylinder 50 inches in diameter, 60 in. stroke, with a blowing tube 96 in. in diameter.

The pump house contains three horizontal Wilson-Snyder compound direct-connected circulating pumps, connected with the harbor, each rated at 6,000,000 gallons per twenty four hours.

The electric power station consists of three 500 k. w. electric generators, and two 550 k. w. generators, each driven by a cross compound condensing engine with cylinders 20 inches by 40 inches in diameter, 42 inch. stroke, running at a speed of ninety revolutions.

Fresh water for the works is obtained from Sydney River. A dam and pumping station have been constructed on the river, and the drainage from an area of 65 square miles is available for service.

The pumping station is equipped with two horizontal tubular boilers, capacity of 110 h. p. each; two pumps, 3,000,000 gallons capacity, and one 6,000,000 gallon compound duplex pump. About 600 ft. of the main line is of 36 inch pipe, and the balance to the works is 24 inches in diameter. Connections have also been made with the city water supply in case additional water is required. The present requirements are from 7,000,000 to 9,000,000 gallons per 24 hours.

The metal from the furnaces is taken in a 25 ton ladle car either to a motor-driven pig casting machine, or to the open-hearth. At the open-hearth it goes directly into the furnaces, or is placed in the 300 ton mixer and kept hot by gas from the coke ovens.



The ten 50 ton Bertrand-Thiel open-hearth steel furnaces are of the tilting type, arranged in a continuous row; metal may be placed in the furnaces from either side, or cold pig, or stock, may be charged by two Wellman-Seaver machines. The product, estimated at 1,400 tons a day, is tapped into 50 tons ladles, from which it is poured into moulds on cars, and transferred to the stripper building to be deposited in the pit furnaces. Gas for the open-hearth furnaces is obtained partly from producers and partly from the coke ovens; a 1,000,000 cubic feet triple left gas holder gives a working pressure of 5 inch. column of water.

The blooming mill has a 35 inch train, direct-driven by a pair of 50 inch by 60 inch reversing engines. The mill is commanded by two 20 ton electric overhead travelling cranes, and one stiff leg crane, used also for charging or drawing ingots from pit furnaces. The mill and pit furnace building contains sixteen pit furnaces, also the necessary approach tables, hydraulic and steam shares.

The blooming mill boiler house contains Babcock and Wilcox boilers, aggregating 3,000 h. p..

The open-hearth plant is equipped with mixers, crushers, elevators, and cupolas, to furnish all refractory material for lining the furnaces.

There are 10 lime kilns, 10 ft. diameter, 35 ft. high, with fire-brick lining. Purified coke oven gas is used for fuel.

*Billet mill.*—The billet mill, an intermediary between the blooming and wire rod mill, and a Morgan continuous 16 inch. mill, producing billets  $1\frac{3}{4}$  inch square section, for wire rods consists of six pairs of rolls, through all of which the blooms pass without a stop, each pair of rolls altering the shape and reducing the cross section, while the sixth pair of rolls turns out the steel to the size required for the rod mill. As the finished product travels along the conveyer, it is cut into lengths by flying shears, which automatically cut the moving bar into 30 ft. lengths. These lengths pass along the conveyer to the skew table, where rollers

set on the bias deflect the product to the left, depositing them side by side, in perfect order, at the edge of the table. From the table the products are pushed by electrically operated go-devils, to billet cars, by which they are conveyed to the rod mill.

*Rod mill.*—This mill, known as a Morgan continuous double strand mill, having a guaranteed capacity of 250 tons per day of 24 hours, receives its stock from the billet mill in 30 ft. lengths, the cross sections of which are  $1\frac{3}{4}$  inch square. The billets are reheated in a continuous gas-fired furnace, having a capacity of 164 billets at a time.

The mill is equipped to roll ten different sizes, from No. 5 wire gauge up to  $\frac{3}{4}$  inch diameter; the most common size being 13-64 inch.

The billets, after reheating, pass without stop through 13 pairs of rolls, starting with the  $1\frac{3}{4}$  inch square, and finishing with the size required.

The mill is also designed to roll double strand; that is, two billets may be rolled at the same time, through different passes in the same rolls. When the diameter is reduced to 13-64 of an inch, or the finished size required, the rod shoots through a pipe of running water and, still red hot, goes to the wheel, where it is wound into a coil, about 3 feet in diameter, and thence is conveyed by an automatic conveyor to the building room. The mill has established a record in monthly productions.

Some of the achievements are shown in the following table:

11 hours .....	164 tons.
1 day .....	305 "
1 week (6 days) .....	1,671 "
1 month .....	6,736 "

*Rail mill.*—This is known as a 24 inch mill, having a capacity of 500 tons per 12 hours, and is operated by a 54 inch by 66 inch Porter Allen engine. The stock, rolled to a suitable size, is received directly from the blooming mill by cable cars.

The stock dimensions necessarily vary according to the weight of the rail, thus an 80 lb. rail requires the bloom to have a cross section of 8 inches square and a length of 13 or 14 feet.

The mill is equipped with three tables, placed side by side, and known respectively as the roughing, the intermediate, and the finishing table. The roughing table is operated by an Otis steam engine; the others are electrically operated. The roughing table was made by Tennett Walker, of Leeds, Eng., from designs furnished by the D. I. and S. Co., the intermediate and finishing tables by the Wellman-Seaver Company. On the first table the bloom is handled by what is called the roughing rolls. At this and at the intermediate table, the rolls are three high, that is, 3 rolls are arranged vertically one above another, which permits of rolling rails both backward and forward without reversing the engine, since the rails pass forward between the bottom and middle rolls, and return between the middle and top rolls. The bloom makes six passes through these rolls, and is conveyed to the intermediate table by hydraulic transfer. The rolls are stationary, but the tables may be raised or lowered at will. The intermediate table, which is known as the split jack-knife type on the roller side, and the full jack-knife type on the catcher's side, controls the piece for four passes, delivering it to the finishing table by an electrically operated transfer; one pass is made on the finishing rolls. These rolls are only two high. The rails pass through the finishing rolls on their side, and receive an imprint similar to the following:—"D. I. and S. Co., Ltd., 1907. 1111, 6001," an abbreviation of "Dominion Iron and Steel Company, Ltd., 1907, fourth month, 60 lbs., No. 1 pattern." The rails coming from the finishing rolls are about 100 ft. long, and are conveyed by rollers to a circular saw of the pendulum, or swinging type, electrically driven, and swung by hydraulic pressure, where they are cut to standard lengths. The rails are cut while hot, and stops are inserted in the conveyer to hold the rail until the saw makes the cut.



From the saw the rails go to the hot beds, capable of receiving 250 rails, and operated by two sets of electrically operated transfers, known as go-devils. From here they are run out to the cold transfer, from which they are dropped into the finishing mill's electric buggy, and distributed to the various straightening presses in the cold finishing mill.

The cold finishing mill is a separate building, containing six loading beds, 5 straightening presses, four ending machines, and two cold saws.

After straightening in the presses the rails go to the ending machine, and after the necessary holes have been bored for the fish plates, they are ready for inspection. From each heat three pieces of rail are cut at the hot saw, from such parts as are liable to be least strong. These are tested, and if falling below the required standard, the whole heat is condemned.

It is customary to operate the rail mill and blooming mill together, the bloom going direct from the buggy to the rail mill without heating. In such cases there is no re-heating required, from the steel ingot to the finishing mill. There is, however, to provide against accidents, a coal-fired furnace, at which, when necessary, the cold blooms may be reheated for the rail mill.

The coke oven plant consists of ten batteries of fifty ovens each, Otto-Hoffman by-product type; total capacity rated at 1,200 tons of coke per day of 24 hours. The ovens are 33 feet 2 inches long by 6 ft. 2 inches high, by 17 inches wide, and are provided with a condensing house 60 by 100 ft., a cistern and the necessary coolers, scrubber, sieve washer, etc., for cooling and cleansing the gas and extracting from it the tar and ammonia. The boiler house contains Babcock and Wilcox water-tube boilers, aggregating 1,500 h. p., with an adequate storing space, and a sulphuric acid plant, with a capacity of 40 tons of acid per day, at which native sulphur is used.

The coal washing apparatus, is built in duplicate; either half may be operated as a separate unit, or both may be operated at

the same time; capacity, 100 tons per hour, or 1,200 tons per shift per unit.

The raw coal is delivered by belt to the breaker, which breaks and screens it to  $1\frac{1}{4}$  inch. mesh, separating hard substances that will not break or go through the mesh. The breaker has a jacket screen with  $\frac{3}{8}$  inch mesh; anything not going through goes to rolls where it is crushed to  $\frac{3}{8}$ . Under the chute which conveys the coal from the jacket screen to the rolls, at a point where all coal must pass over it, is a strong magnet, which conveys all metallic substances, rail spikes, cutter points, etc., away from the rolls.

The coal is conveyed from the rolls to bins over the Compbell 48 inch dumping washing tables, having an approximate capacity of 5 tons per hour.

The washed coal goes from the tables to the drainage pits, where it stands 50 hours; thence by elevator to the conveyor belt, which distributes it to the oven bins.

#### *Analyses of Coke.*

Constituents.	I	II	III	Cost of Coke.
Vol. matter.....	2·30	1·56	1·75	\$2 to \$2.15 per ton after allowing for value of By-products
Fixed carbon.....	91·70	91·30	91·55	
Ash .....	5·00	6·10	5·57	
Sulphur .....	1·20	1·14	1·13	
	100·00	100·00	100·00	

After the by-products are taken from the gas 60 per cent. is returned to the coke ovens for heating, and 40 per cent. delivered to the open hearth furnaces.

The tar is pumped to storage tanks, and sold to the Dominion Tar and Chemical Co., Ltd., who produce on the Steel Company's property, refined tar, soft pitch, briquetting pitch, black varnish, roofing cement, soluble disinfectant or sheep dip, crude benzole, rectified benzole, creosote oil, liquid creosote, creosote stain, crude carboic acid, purified carboic acid, crude naptha, purified naptha, emulsion (germicidal), ammoniacal liquor oil, and light oil.

Unfortunately for the development of the Provincial iron fields this large Nova Scotian steel company does not avail itself of the Provincial ores, and does not therefore do for Nova Scotian iron mining what its parent the Dominion Coal Company does for the Provincial coal industry. The principal source of the iron ore smelted at Sydney is Wabana mines, Bell Island, Conception Bay, Newfoundland, 425 miles from Sydney. The cliffs of that island hold six beds of ore, three thin and low grade and three superior, known as the lower, middle and upper beds.

The following is an average analysis from 20 cargoes of this ore received during 1906:

Metallic iron .....48.999 per cent.

Silica .....16.827 per cent.

Phosphorus ..... .834 per cent.

A more complete analysis is as follows:

	As received	Dried at 212 degrees
Moisture.....	1.49 p. c.	
Metallic iron.....	50.50	51.26 p. c.
Silica.....	13.42	13.64
Phosphorus.....	.744	.746
Sulphur.....	.031	.031
Alumina.....	4.10	4.19
Lime.....	2.12	2.14
Magnesia.....	.66	.67
Manganese.....	.25	.25
Titanic acid.....	.47	.47



The cost of the ore delivered in stock bins at Sydney, C. B., is said to be:

	Cents.
70 Mining and transportation to shipping pier	.363 per ton
05 Loading in steamer .....	.005 per ton
40 Freight by steamer to Sydney, C. B.....	.305 per ton
10 Unloading at Sydney, C. B.....	.036 per ton
05 Allowance for dockage at Sydney, C. B..	.059 per ton
08 Allowance for royalty .....	.050 per ton
<hr/>	
Total .....	\$0.817 per ton

The Company, however, uses Cape Breton fluxes, principally from Marble Mountain, East Bay, Bras d'Or Lakes, where it owns 521 acres. The stone is quarried and conveyed direct to a No. 9½ Gates crusher, from which it is conveyed by a 26-inch. rubber belt to the storage bins, which will hold 14,000 tons. The steamers are loaded by rubber belts, at the rate of from 600 to 700 tons per hour.

The stone is a crystalline variety formerly worked as a marble quarry, for building purposes. The quality is:

Carbonate of lime .....	94. 590 per cent.
Carbonate of magnesia .....	2. 970 per cent.
Insoluble matter .....	2. 360 per cent.
Sulphur .....	. 072 per cent.
Phosphorus .....	. 008 per cent.

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100,000 per cent.

*Dolomite*.—This is obtained from the Company's quarry at Scotch Lake, 16 miles from Sydney, via the Intercolonial Railway:

## Analysis:—

Carbonate of magnesia .....	42.750 per cent.
Carbonate of lime .....	53.670 per cent.
Silica .....	1.330 per cent.
Sulphur .....	0.356 per cent.
Alumina and iron oxide .....	1.800 per cent.
Phosphorus .....	0.094 per cent.
	<hr/>
	100,000 per cent.

The normal number of men employed by the Company in Cape Breton is 4,000, at wages averaging \$2.00 per day, ranging from 14 cents an hour for unskilled, to \$5.50 or \$6.00 per day for skilled services.

The relations between the Steel and Coal Companies have not of late been entirely harmonious, owing to the unwillingness of the latter to supply coal (necessarily suitable for metallurgical purposes) at the low contract price of \$1.24 per ton, plus an allowance of 4 cents per ton for the use of cars. In consequence of this the Steel Company is said to have suffered losses amounting to \$3,951,092.78 between A. D. 1906, and April 1, 1909; and by a decision of the Privy Council of Great Britain, the actual losses are being adjusted and paid to the Steel Company by the parent Company.

The industrial relations between the two corporations are now considered harmonious, and it is hoped that the junior organization, which has so effectually in part realized the demand for industries in Cape Breton, will consequently soon become independent of the State bounties so liberally contributed toward its upbuilding.

The organization of these large coal and steel producing corporations has opened a new era of industrial activity in Nova Scotia; and, with the similar combination, more recently established at Sydney Mines, on the opposite side of Sydney Harbor, has laid a foundation for those national industries of Canada, which are obviously destined to thrive pre-eminently in Nova Scotia.

## CHAPTER IV.

Messrs. Bown's successors (the General Mining Association) sold out "Sydney Mines" and all their contiguous coal estates, etc., to the Nova Scotia Steel and Coal Company, Limited, in A.D. 1899-1900, and after an honorable career, retired from the industrial life of Canada.

Their operations in Nova Scotia are stated to have been unremunerative up to A. D., 1846, when a small dividend was paid. £1 of the original capital of £274,690 in fully paid £10 shares was refunded in 1874; £1 in 1880, and £2.10 in 1894, i. e., between 1874 and 1894, nearly 50 per cent. of the original capital was refunded.

The extension of Sydney Mines under the Atlantic in 1877 ultimately established the company on a permanently profitable basis. The following is a table of dividends paid to the shareholders after 1877 :—

			Rate	Amount paid out.
1877	2/6 per share equal to		1 1/4 p. c.	£ 3,433
8	4/	"	2 1/2 "	5,493
9	2/6	"	1 1/4 "	3,433
1880	4/6	"	2 1/2 "	6,179
1	4/	"	2 1/2 "	5,493
2	4/	"	2 1/2 "	5,493
3	10/	"	6 "	13,732
4	8/	"	5 "	10,986
5	5/	"	3 "	6,866
6	5/	"	3 "	6,866
7	5/7	"	3 1/2 "	7,666
8	6/	"	3 1/2 "	8,239
9	6/	"	3 1/2 "	8,239
1890	6/	"	3 1/2 "	8,239



			Rate	Amount paid out
1891	8/	per share equal to	5 p. c.	£ 10,986
2	10/	"	6 "	13,732
3	15/	"	9 "	20,598
4	14/	"	8½ "	19,224
5	12/	"	11 "	16,478
6	15/	"	13¾ "	20,598
7	12/6	"	11 "	17,164
8	11/	"	10 "	15,105
9	12/	"	11 "	16,478

Total sent to England 1877-1894 £250,720  
equal to \$1,218,499.

Thirty "Bauer" coke ovens 38' long x 7' high x 20" wide, capacity 150 tons per day and a "Stein's Patent" coal washing plant, capacity 500 tons per day were erected at Sydney Mines by their successors for the manufacture of coke for the Blast furnace at Ferrona, near New Glasgow. In 1902 three slopes and a shaft were sunk on the Lloyd Cove seam 6' 4" ("Sydney No. 2" mine), and three slopes were opened on the north side of Big Pond ("Sydney No. 3." mine) to win the Main seam land and submarine.

In 1903 "Sydney No. 2" mine passed under the Atlantic at 104 feet cover; and on August 30th, 1904, the Steel Company's first "Sydney Mines" Blast furnace, capacity of 200 tons per day, was blown in. This furnace, designed by F. C. Roberts & Co., of Philadelphia, U. S. A., was built 85' high, diameter at Stock line 12' 6"; at Bosh 17' 8" and at Hearth 11' 6", and it was fitted with four "Cowper" stoves, 12' diameter x 85' high, and vertical quarter crank, disconnected type, compound, condensing, blowing engines. Three batteries, i. e., 120 Bernard Retort coke ovens were erected at the Furnace; and three 40 ton Basic Siemens Martin steel furnaces, also a rolling furnace with a capacity of

180 tons of liquid metal, operated by gas obtained from sixteen Duff Gas Producers 10' diameter x 12 1-2' high, have been added to the plant.

The main slope of "Sydney No. 3" mine passed under the sea at 300' cover in 1905, the "Queen Pit." "No. 5" mine closed 35 years previously, was re-opened in 1906; and No. 4 colliery was opened on the "Main Seam" in 1907.

Modern coal shipping and ore receiving piers, to accomodate steamers drawing 30' of water have been erected at the old shipping ground at North Sydney. The top of the coal pier, which with its approaches is 1900 feet long, is 60 feet above high water level and 5,000 tons of coal can be stored in the bins built into it. The low level pier, which with its approaches, is 1300' long, is 34 feet above the water; and the ore receiving pier, capacity 2500 tons per day, 1140' long, is 42' above water level.

The following table exhibits the Steel Company's production at its Cape Breton collieries to date:

	Production Tons	Labor employed	Av. tons raised daily.
1900	249,910	710	889
1	238,646	701	809
2	241,891	908	870
3	397,366	1526	1342
4	492,604	1661	1831
5	504,126	1449	1888
6	665,033	1949	2866
7	664,404	1864	2595
8	662,350	1792	2245

The average daily earnings for contract men or men paid by the ton at the Company's Cape Breton collieries during the first four months of A. D., 1908, after deducting the charge for explosives, are said to have been:

1908			Jan.	Feb.	March	April	Average
Miners	No. 1	Col.	2.54	2.45	2.60	2.47	2.51
Miners	No. 5	"	2.99	2.97	2.84	3.01	2.95
Drivers	No. 1	"	1.85	1.84	1.84	1.81	1.83
Drivers	No. 5	"	1.71	1.76	1.74	1.76	1.74
Shotfirers	No. 3	"	4.02	4.20	4.51	4.52	4.31
Mach, Run.	No. 3	"	4.57	4.63	4.10	4.70	4.50
Loaders	No. 3	"	1.93	2.03	2.14	2.13	2.05

Householders employed in and around the mines, received an indirect addition to the above rates by the delivery to them at the yards of best household coal, at \$1.00 per ton. i.e., one-third the regular market price. The quantity of coal so sold to the workmen during A. D., 1907, was 11,806 tons, at a loss to the company estimated at about \$22,500. The company's collieries had to be operated six days to procure this "workman's coal", and twelve additional days to make up the loss incurred thereon. The following analysis of the N. S. Steel Company's financial record is from the columns of the *Montreal Star*.



## NOVA SCOTIA STEEL CO.—PROGRESS AND DIVIDENDS.

The student of Corporation Finance will note the growth of profits, and the increasing cost of properties :

	1901.	1902.	1903.	1904.	1905.	1906.	1907.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Iron ore mined .....	350,000	428,000	339,769	246,022	308,361	300,000	346,505
Coal mined .....	238,000	238,457	447,218	538,392	596,901	681,021	692,970
Pig iron made .....	26,000	25,000	25,544	31,567	30,080	49,412	57,618
Steel ingots made .....	26,000	18,000	30,000	30,000		51,672	70,222
Cost of properties .....	\$6,662,042 10	\$7,614,447 88	\$ 9,265,619 55	\$10,359,433 70	\$11,037,146 33	\$11,519,416 60	\$11,897,802 97
Total assets .....	8,538,772 30	9,675,190 61	10,879,149 15	12,408,050 31	13,036,064 44	13,237,760 90	13,810,881 70
Profits .....	508,956 79	609,935 24	839,387 19	501,397 24	559,906 63	960,281 03	944,790 66
To dividend on Common stock .....	123,600 00	191,115 00	246,804 00	44,690 00			290,256 00
Bonds issued .....	2,500,000 00	2,500,000 00	2,443,000 00	3,890,500 00	3,838,000 00	3,732,000 00	3,660,000 00
Preferred Stock .....	1,030,000 00	1,030,000 00	1,030,000 00	1,030,000 00	1,030,000 00	1,030,000 00	1,030,000 00
Common Stock .....	3,090,000 00	4,120,000 00	4,120,000 00	4,993,300 00	4,970,300 00	4,987,600 00	4,987,600 00
Ratio of dividend .....	4 per cent.	4 per cent.	6 per cent.	3 per cent.	Passed	Passed	6 per cent.
Ratio profits to assets .....	5.94 per cent.	6.34 per cent.	7.93 per cent.	4.4 per cent.	4.28 per cent.	7.34 per cent.	6.84 per cent.
Ratio profits to capital .....	7.68 per cent.	7.97 per cent.	11.28 per cent.	5.2 per cent.	5.60 per cent.	9.58 per cent.	9.43 per cent.

Since the publication of the above, Messrs Price, Waterhouse & Co. (Chartered Accountants in England and Wales) have certified the annual profits of the Company during 1906-7-8 as follows:—"We have examined the books of The Nova Scotia Steel & Coal Company, Limited, at New Glasgow and Sydney Mines, Nova Scotia, for the three years ending December 31st, 1908, and we certify that the profits for the period before charging interest, Provision for Depreciation and Blast Furnace Relining, and the remuneration voted annually by the Shareholders to the Directors after the closing of the accounts were as follows:—

	Before crediting Govt. Bounties	Govt. Bounties	Total Profits
1906 .....	\$799,399 81	\$150,966 72	\$950,366 53
1907 .....	760,580 33	179,210 33	939,790 66
1908 .....	586,767 12	147,934 41	734,701 53

The only differences between the above profits and the published statements are, that we have deducted from the profits of 1906, the sum of \$9914.50 fire loss which was charged against the Reserve set aside by the Directors to Fire Insurance Fund in that year, and from the profits of 1907 the sum of \$5,000.00 set aside for Contingent Liabilities. We also certify that during the above years the sum of \$667,608.14 was set aside out of the above profits for Depreciation of Plant, etc., and \$40,528.75 for Blast Furnace Relining which sums we consider amply sufficient.

## CHAPTER V.

The following chapter is devoted to minor operations not noticed in the foregoing review of the Sydney Coalfield.

The New Campbellton Colliery was opened about 1862 on the northern edge of the coalfield, between St. Ann's Mountain and the Great Bras d'Or, by the Hon. Charles J. Campbell, of Baddeck. The original winnings were on a 4' and a 6' seam, and the coal was shipped at the neighboring port of Kelly's Cove. The colliery was re-equipped with a modern plant in 1893-4, in 1904, a new slope was driven 2,000' north of the old slope, and in 1908 the property was acquired by London, England interests. The sales of coal to date have been :

Year	Sales, Tons	Labor Employed.	Year.	Sales, Tons.	Labor Employed.
1863	3968	.....	1880	4218	.....
4	6393 (9 mos.)	.....	1	*200	12
5	5237	.....	1894	13116	115
6	8282	100	5	8694	55
7	4900	46	6	14496	56
8	2082 (15 mos.)	22	7	11623	58
9	231	8	8	5993	34
1870	272	11	9	10363	51
1	8	.....	1900	9891	.....
2	Closed	.....	1	11309	51
3	238	81	2	9352	36
4	4501	95	3	4883	77
5	3732	65	4	4927	40
6	2991	48	5	3375	44
7	1387	34	6	2785	29
8	518	28	7	926	37
9	3480	39	8	Not in operation	

\*Raised

The Gardiner Mining Company of Montreal sunk a shaft 162' to the Gardiner seam 4' 8½" thick on the south side of Bridgeport Basin, in A. D. 1873. The shaft was connected with an air shaft 55' deep; an 80,000—100,000 ton per annum plant, 18 double miners' cottages, a manager's and foreman's house and office were erected; and a contract was entered into with the International Coal Company to ship the output at its Sydney pier for 30-32 cents per ton.

The coal varied from 4' 9" to 3' 6" thick, and has not been extensively mined.

The sales to date have been :—

Year.	Tons.	Labor employed.	Average Tons raised daily.
1873	5686	89	42
4	15640	90	119
5	11380	65	65
7	3785	80	84
1891	17105	87	94
2	39485	....	....

The Acadia Colliery" was opened on the "Ross" seam at Schooner Pond by Mr. Hugh Ross, in A. D. 1862. The mine was closed in 1866, owing to the lack of local shipping facilities, but operations were resumed in A. D., 1872 by the Schooner Pond Company, of London, England. The latter company added the submarine extension of the "Clyde Area" to the property, drove an 11' slope on the crop of the seam, west of the full dip 300 yards from the shore, and connected it, at 184' with the water level of the old winnings. Side slopes of 6' wide were also driven to the dip; a small village was built and the Glasgow and Cape Breton Railway was extended from "Reserve Colliery" to the works.

The colliery was abandoned in 1874, the slopes then standing 600 feet down in coal which had thinned to 4' 3" thick.

The sales, those subsequent to 1874 being exbank, were :—



Year.	Tons.	Year.	Tons.
1862	370	1873	3964
3	1360	4	1384
4	4930	5	1658
5	2380	6	2719
6	37	7	1665
1872	1268	8	3

Two collieries were opened on the South Head of Cow Bay in 1863 and 1864. (1) The Mira Bay mine, in the Tracy seam, 4' 1½" thick, half of which is said to be good, and half very good. The winnings were closed in A. D., 1866, after the sale of 2983 tons of coal. The inland extension of the seam which is apparently the deepest workable coal in the Morien Basin, is said to have been discovered at Homeville, in the following borehole, sunk in, A. D., 1907: (Dip of strata 13°. N. 12° E.)

NAME OF ROCK	THICKNESS BORED		TOTAL DEPTH	
	Feet	Inches	Feet	Inches
Surface, Sandstone and Shale.....			104	2
Coal.....		2	104	4
Sandstone and Shale.....			208	10
Shale and Coal.....	1		209	10
Sandstone and Shale.....			250	2
Coal.....		4	250	6
Sandstone and Shale.....			289	2
Shale and Coal.....		6	289	8
Shale and Sandstone.....			385	8
Coal.....		4	386	.....
Shale and Sandstone.....			550	2
Coal.....	3	11	.....	.....
Fire Clay.....	1	3	.....	.....
Coal.....	1	4	.....	.....
Fire Clay.....	2	2	558	10

NAME OF ROCK	THICKNESS BORED		TOTAL DEPTH	
	Feet	Inches	Feet	Inches
Shale .....			566	2
Coal .....		3	566	5
Shale and Sandstone .....			884	8
Conglomerate .....	2		886	8
Sandstone .....	7		893	8
Conglomerate .....	1		894	8
Sandstone and Shale .....			942	8
Conglomerate .....	1	6	944	2
Sandstone and Shale .....			1081	2

The mine opened at Broughton, (Loon Lake), some miles further inland, but not now worked, is said to be upon the continuation of this seam. (2) The Caledonia Colliery was opened on the opposite or eastern end of the South Head, in 1864, in 3' 4" of the continuation of the Ross or "Emery" seam of Schooner Pond.

The winnings on this seam—the second in descending order beneath the Gowrie—consisted of a slope from the outcrop, a shaft 71 feet deep, about 80 yards from the crop, and a level from the base of the cliffs, and extended 90 yards to the dip of the shaft in hard, compact, excellent coal, capable of sustaining transportation and exposure better than some other Cape Breton fuels. The sales of coal up to the cessation of work in 1877 were:

Year.	Sales. Tons.	Labor Employed.	Year.	Sales, Tons.	Labor Employed.
1864	162	19	1871	48	5
5	1083	....	2	1859	14
6	938	13	5	539	45
8	1895	61	6	916	4
9	40	.....	7	378	....
1870	189	....			

The Indian Cove (No. 3) seam of the Sydney Mines section, was opened by The North Sydney Mining & Transportation Company, Limited, at Indian Cove, Sydney Harbor, in 1895. A small pier was built near the mine, and the following sales of coal have been made:

Year.	Tons.	Year.	Tons.
1895	227	1902	7682
6	1005	3	12071
7	5059	4	8769
8	7045	5	4638
9	3993	6	3733
1900	7180	7	3381
1	8743	8	4607

Two small mines have been recently opened between Sydney Harbor and the N. W. boundary of the coal field vide Mines Report, N. S., 1908.

Since A. D., 1900, the following boreholes have been sunk in the Sydney Coalfield—

To the "Mullins" seam,—perhaps a continuation of the Tracy seam of the Morien Basin—at the head of Lingan Basin, as follows, in 1901-2:—

No. 1	No. 2
Shales..... 2 ft. 0 in.	Clay..... 9 ft. 6 in.
Coal ..... 1 ft. 0 in.	Shales ..... 15 ft. 0 in.
Shales ..... 22 ft. 0 in.	Coal..... 1 ft. 1½ in.
Coal, with 1½ in.	Shales ..... 22 ft. 0 in.
parting ..... 4 ft. 6 in.	Coal..... 4 ft. 10 in.

At the Gardiner Mines, Lingan Bay: (No. 1) 60 feet north of the Bridgeport Road, on the west side of Black Brook. Dip of strata 3°, S. 75° E.

Surface, Sandstone, Shale and Fire Clay, 350 ft. 5 in.

Coal, 5 feet 10 inches.

Shale and Sandstone, 273 feet 6 in.

No. 2 Hole. About one hundred yards east of Dan McDonald's Gate. Dip of strata, 4°, S. 70° E.



Surface, Sandstone and Shale.....	80	feet	9	inch.
Conglomerate.....	3	"	0	"
Sandstone.....	4	"	0	"
Conglomerate.....	1	"	9	"
Sandstone, Shale and Fireclay .....	42	"	1	"
Coal .....	1	"	6	"
Blue Shale, showing fossils .....	16	"	4	"
Coal .....	4	"	4	"
Fireclay .....	3	"	6	"
Grey and Blue Sandstone and Shale in Bands ...	112	"	10	"

Total depth of hole.....270 feet 1 inch.

At South Bar, on the farm owned by Henry Nunn, 200 feet south-west of a culvert over a small brook on the old railway to Victoria Mine, A. D., 1907:

NAME OF ROCK.	THICKNESS BORED.		TOTAL DEPTH.	
	Ft.	In.	Ft.	In.
Surface, Sandstone, Shale and Conglomerate ....	72	7	10	

At Birch Grove, near Port Morien, in 1908. No. 1 Hole:  
Dip of strata 4° N.

Surface, Sandstone and Shale.....	98	11
Coal.....	6	100 5
Shale.....	7	102 ....
Coal .....	5	107 10
Fireclay .....	6	108 4
Sandstone and Shale.....	323	9
Coal .....	8	324 5
Shale and Sandstone .....	385	....
Coal, dirty.....	6	....
Shale.....	4	....
Coal, dirty .....	9	....
Shale.....	5	....
Sandstone.....	41	5 ....
Coal, dirty .....	6	434 6
Shale and Sandstone.....	457	10
Coal .....	3	461 4
Shale and Sandstone.....	536	4

NAME OF ROCK.	THICKNESS BORED.		TOTAL DEPTH.	
	Ft.	In.	Ft.	In.
Coal, dirty .....	4	.....	54 <sup>0</sup>	4
Fireclay, Sandstone and Shale .....	...	.....	54 <sup>8</sup>	4
Coal and Shale .....	1	9	55 <sup>0</sup>	1
Sandstone, Shale and Fireclay .....	.....	.....	61 <sup>2</sup>	11
Coal .....	.....	6	61 <sup>3</sup>	5
Shale and Sandstone .....	.....	.....	76 <sup>0</sup>	7
Coal .....	1	10	76 <sup>2</sup>	5
Shale .....	.....	.....	76 <sup>9</sup>	6

No. 2 Hole  $1\frac{1}{2}$  miles south of No. 1, about 250 yards north of a small brook running east and west. Dip of strata from  $29^{\circ}$  to  $7^{\circ}$  at bottom.

Surface, Sandstone, Shale & Conglomerate .....	.....	109 <sup>5</sup>	5
Coal .....	1	109 <sup>6</sup>	5
Shale and Sandstone .....	.....	113 <sup>8</sup>	2
Coal .....	6	113 <sup>8</sup>	8
Shale and Sandstone .....	.....	115 <sup>5</sup>	8
Coal .....	6	115 <sup>6</sup>	2
Shale and Sandstone .....	.....	117 <sup>0</sup>	11

At Mill Brook, Port Morien, in 1908:

Sandstone and Shale .....	.....	124	9
Coal (Blockhouse Seam) .....	9	134	6

## CHAPTER VI.

On the N. West the Sydney Coalfield is bounded by lofty pre-carboniferous highlands, which extend to St. Ann's Bay.

The contact of the coalmeasures with the older series is visible in a brook cutting the beds at right angles to their strike, according to the Geological Survey, as follows: "Section of Strata from the Lowest Bed of the Productive Coalmeasures to the Syenite between Kelly Cove and Cape Dauphin.

1. Bluish Argillaceous Shale—Coalmeasures,
2. Fine grained, laminated, dolomitic limestone with calcspar between the joints,
3. Compact, dolomitic limestone, carrying specks of galena and iron and copper pyrites; stained lead grey in the joints,
4. Laminated, contorted, crystalline limestone,
5. Massive white dolomite,
6. Fine-grained, yellowish-white and blue, serpentinous and Calcareous rocks, intersected by small quartz veins.
7. Red Syenite."

About a mile west of Cape Dauphin, the pre-carboniferous highlands are flanked by a mass of carboniferous limestone, worn into "Fairy Holes" which ramify the interior of the cliff. The Lower Carboniferous series, interrupted by the Pre-Carboniferous highlands, re-appears on the southern and western side of St. Ann's Bay and continues Northeast along the coast to South Bay, interrupted at two points by a Pre-Carboniferous shore. The littoral of South Bay is partially fringed by Lower Carboniferous strata, and that of North Bay, especially near Ingonish, by more extensive exposures of the same series, bounded inland by Pre-Carboniferous rocks, which occasionally interrupt it at the shore and re-appear



with the Lower Carboniferous on Ingonish Island. The Pre-Carboniferous series then occupies the coast to Aspy Bay, from which the Lower Carboniferous penetrates some distance inland along the valleys of the local streams; but the older series immediately re-occupies the coast as far as the Lower Carboniferous Cape North. Excepting a Pre-Carboniferous exposure about 1 1-2 miles long in the contiguous Bay St. Lawrence, the northern extremity of Cape Breton is Lower Carboniferous strata extending (apparently) under the Gulf to St. George's Bay, Newfoundland. The western, or gulf coast of Cape Breton is a similar alternation of Lower Carboniferous with Pre-Carboniferous rocks, until it is overlain by higher measures in the County of Inverness. Strata higher than Lower Carboniferous, forms the coast line from a point about 4 miles Southwest of Cheticamp Island, almost to Marsh Point, interrupted Northeast and Southwest of Margaree Harbor, and cut off very rapidly inland by the underlying Lower Carboniferous series. The submarine mining formerly carried on, without inconvenience from Chimney Corner, indicates that coal-measures extend seaward at that point. The following coal was sold at a colliery opened in a 5 foot seam at Chimney Corner in A. D., 1867 and a 3 f.t 6 in. seam in 1868.

Year.	Tons.	Persons Employed.	Seams reported at Chimney Corner.
1868	131	....	Thin Seam 1 ft. 6 in.
69	332	.....	" 3 ft. 0 in.
70	380	....	" 5 ft. 0 in.
1	440	16	" 3 ft. 6 in.
2	3070	51	
3	350	20	
8	80	11	
1883	753	14	
Closed.			

The winnings were mainly submarine. The land area underlain by the three upper seams at this mine has been estimated to

hold, with its submarine extension to the extent of half a square mile, 15,000,000 tons of coal.

The following hole was drilled on Cheticamp Island, in A. D., 1904:—

Surface Loam and Clay, Sandstone and Shale, 663 feet 4 inches.

The following hole was drilled on the Neil McLeod Brook, about 300 feet down from the Main Road, at St. Rose, about  $4\frac{1}{2}$  miles south westward of the Chimney Corner Mine, in 1904:—

	Ft.	In.
Surface material, shale and sandstone .....	89	1
Bright coal.....	4	1
Soft black shale.....	1	..
Fireclay.....	1	6
Shale.....	4	2
Dark shale.....	3	10
Light shale.....	1	11
Coaly shale.....	2	6
Light shale.....	..	6
Coaly shale.....	3	6
Shale and Sandstone.....	171	10
Dirty coal.....	8	4
Black shale.....	3	..
Grey sandstone.....	31	10
Hard blue shale.....	4	10
Grey sandstone.....	23	1
Hard blue shale.....	8	2
Coaly matter.....	..	5
Shale and sandstone.....	23	11
Blue shale.....	17	1
Coaly matter.....	..	8
Fireclay.....	..	4
Dirty Coal.....	1	9
Sandstone and Shale.....	159	7
Bright coal.....	8	..
Blue fireclay.....	1	4
Shale and sandstone.....	72	2

The higher measures are interrupted near Marsh Point by a Lower Carboniferous shore, some 5 miles long. This indicates (perhaps) a corresponding rupture in the submarine field. The Broad Cove coalmeasures, then occupy the coast or its vicinity perhaps for about 6 miles. A little coal was lightered to small colliers off Broad Cove, in 1877; and an inconsiderable quantity was shipped between 1895—1899, at McIsaac's Pond, from a 7 foot seam. The builders of the railway from the Intercolonial main line into Inverness, subsequently drove slopes in the 7 foot seam to win the submarine extension of the field, then estimated to hold fully 40,000,000 tons of coal within half a mile of the shore; and their winnings passed under the Gulf in 1903. The coal is now shipped via. the Inverness Railway, at Port Hastings, on the Straits of Canso, 56 miles from the mine. The following is a descending section of the seams at this colliery, as reported by the operators:—

	Ft.	In.		Ft.	In.
Seam .....	2	7	Strata .....	150	...
Strata .....	9	...	Seam .....	1	10
Seam .....	...	4	Strata .....	90	...
Strata .....	21	...	Seam .....	7	...
Seam .....	1	2	Strata .....	125	...
Strata .....	110	...	Seam .....	...	4
Seam .....	1	...	Strata .....	200	...
Strata .....	50	...	Seam .....	1	...
Seam .....	...	8	Strata .....	110	...
Strata .....	29	...	Seam .....	4	...
Seam .....	13	...	Strata .....	223	...
Strata .....	113	...	Seam .....	2	8
Seam .....	...	5			

Dip N. 7° E. 15-43°. Strike N. 83° W.

A 700 feet horizontal tunnel from the 7' to the 13' seam proves it is said that the latter deteriorates to 5' 7" thick, inclusive of 21 inches of clay, to the deep.

The sales of coal from the Broad Cove district to date have been:—



Year.	Tons.	Year.	Tons.
1877	218	1897	402
8	564	8	4808
9	671	9	939
1881	45	1902	23027
2	118	3	119390
6	100	4	148814
1891	150	5	124548
4	138	6	167947
5	328	7	225517
6	513	8	244691

Persons employed, 568, and average daily output, 981 tons in 1908.

The following holes have been drilled in the Broad Cove district:—

In 1903 a hole was put down about 2500 feet east of Mc-Isaac's Pond, as follows:—

Sand and pebbles, clay, sandstone and shale, 68 feet 4 inches.

Two other holes were bored, 29 ft. and 61 ft. respectively, with practically the same results.

A fourth as follows:

	Ft.	In.
Sand and drift wood.....	31	..
Coal .....	5	8
Sandstone.....	1	4
	—	—
Total depth of hole.....	38	..

And a fifth hole as follows:—

	Ft.	In.
Sand and cobble stones, mud and sandstone..	64	...
Coal .....	6	9
Shale and sandstone.....	1	3
	—	—
Total depth of hole.....	72	...

Five holes were drilled in the same district in A. D., 1907, as follows:—

No. 1 About 1-8th of a mile south of the seashore and 1-4th mile north of Broad Cove Chapel,

No. 2. 225 feet south of No. 1,

" 3 Underground in No. 6 Level, West, Inverness Mine,

" 4 " " " " " " " "

" 5 1-8th of a mile N. W. of the Inverness mine and about 5 rods from the seashore.

No. 1 Hole.			No. 5 Hole.		
	Ft.	In.		Ft.	In.
Surface .....	17	..	Surface.....	12	..
Gypsum .....	26	4	Sandstone .....	30	..
Fireclay .....	7	2	Shale, 8 in. Coal, and Fireclay .....	5	2
No. 2 Hole.			Fireclay and Shale...	7	10
Surface.....	24	6	Shale and Sandstone .	23	1
Gypsum .....	79	5	Shale, Fireclay and 5 ft. of Coal.....	11	9
Gypsum and Fireclay.	2	7	Shale and Sandstone .	16	0
No. 3 Hole.			Shale, Fireclay and 3 ft. of Coal.....	5	6
Sandstone .....	15	..	Sandstone and Shale .	112	..
No. 4 Hole.			Shale, 5 inches of Coal, and Fireclay .....	4	..
Sandstone and Shale .	23	..	Shale and Sandstone .	62	6
Coal .....	7	..	Total Hole 5....289 10		

Southwest of the Broad Cove district the coastal exposures of the underlying rocks are fringed at Finlay and Coalmine Points, Mabou, by very slight exposures of very steeply inclined coal-measures, resting upon the Lower Carboniferous series. These are described in some detail at 61 H et seq, Report Geological Survey of Canada, 1882-3-4. The coalmeasures extend from Coalmine Point under the Gulf of St. Lawrence, and the coal has been followed 1675 feet direct into the submarine field. These winnings have, however, been abandoned, (1909), owing to a heavy inrush of water. The angle of the dip in the abandoned workings, said to decrease to about  $4^{\circ}$ , is reported to be  $34^{\circ}$  at the

face of the slope; the reported estimated cover on the coal at 2,000' seaward is 700'. The known seams are reported to include at, and in the vicinity of the mine, descending order, i. e., southerly :—

Ft.	In.	
7	0	— Strata 13 ft. 0 in.
8	0	— “ 475 “ 0 “
15	0	— “ 20 “ 0 “
5	0	

The quantity of coal in workable seams has been estimated at 27,000,000 tons per square mile.

Fourteen hundred feet down the recently abandoned slope the 7' and 8' seams are separated from each other by only 4' of coal and shale, which was sunk through in 1905-6. The quality of the 8' seam at that point proved so superior to the 7' that the coal mined at this colliery in 1906 was taken from it. The 15 ft. seam has been slightly worked.

The sales of Mabou coal to date have been :—

Year.	Tons.	Persons Employed.	Year.	Tons.	Persons Employed.
1887	60	3	1901	852	12
1893	598	17	2	....	.....
4	326	7	3	107	105
5	....	.....	4	141	38
6	286	20	5	975	45
7	289	....	6	10905	89
8	315	4	7	3181	42
9	126	6	8	9087	94
1900	65	17			



The coal at Finlay Point called the "Thirteen Foot Seam" is rolled up on the Lower Carboniferous series at an angle of about 45 degrees N. E.

The extensive rupture of the coal field between Broad Cove and a point S. W. of Mabou Harbor, is for about  $6\frac{1}{2}$  miles along the coast succeeded by higher measures holding the Port Hood coal seams.

In A. D. 1865 The Cape Breton Company drove a slope in one of the Port Hood seams, measuring about 200' from each side of the opening:—

## South Level.

## North Level.

	Ft.	In.		Ft.	In.
Coal with bands . . . .	1	5	Coarse coal . . . . .	..	8
Slaty band . . . . .	..	9	Coal with partings . . .	..	10
Coal . . . . .	4	2	Good coal . . . . .	4	4 $\frac{1}{2}$
	—	—		—	—
	6	4		5	10 $\frac{1}{2}$

The winnings were abandoned in A. D., 1867. In 1875 a slope was driven under the Gulf at a cover of 150'. Operations were suspended in 1878, but in 1900-02 the 7 ft. seam was re-opened and re-equipped, and a loading pier was erected in Port Hood Harbor. The construction of a railway from the Inter-colonial system near Point Tupper through Inverness by the Broad Cove operators has provided an alternative outlet for this colliery during the winter months. Faults have been encountered under the Gulf; but it is stated that the thickness and quality of the coal have increased and that the dip has decreased in that direction from 22° at the mouth of the slope to 13° in the mine. The sales to date have been:—

Year.	Sales, Tons.	Labor Employed.	Year.	Sales, Tons.	Labor Employed.
1865	1680	....	1901	10836	169
6	3560	....	2	33056	92
7	5140	.....	3	65631	235
1875	315	.....	4	70536	215
6	2250	.....	5	22557	84
7	246	.....	6	14939	60
8	22	.....	7	63885	Not reported
1900	1770	....	8	82202	216

The following borehole was put down in November, 1902, about 200 ft. south of the supposed crop of the seam being worked by the Port Hood Coal Company, and close to their offices:—

	Ft.	In.
Surface, shale and sandstone .....	98	10
Bright coal .....	....	6
Shale and Sandstone .....	97	11
Coal .....	....	6
Shale and sandstone .....	309	7
Coal .....	2	8
Dark coaly shale or splint and dark shale .....	12	5
Coal .....	.....	4
Sandstone and shale .....	47	9
Coal .....	.....	6
Shale and sandstone .....	246	3
Coal .....	1	6
Sandstone and shale .....	26	2

A second hole was put down 300' east of the iron bridge over

Little River, as follows:—	Ft.	In.
Red clay and small boulders .....	25	6
Coal .....	2	6
Dark shale .....	24	8
Coal .....	.....	6
Shale and sandstone .....	272	8
Coal .....	1	6
Shale and sandstone .....	31	2
Coal .....	....	9
Dark shale .....	5	....
Coal .....	1	....
Shale, sandstone and 9 coal seams, largest of which is 3 ft. ....		

Total depth of hole .....	735	9
---------------------------	-----	---

A third hole was bored near the South end of Smith's Island in 1903, as follows:—

Surface material, sandstone, with conglomerate bands, conglomerate, sandstone and shale, 805 ft. 4 in.

A fourth hole was put down 300' from the junction of Main and Lawrence streets, Port Hood, on the road to Little Mabou, in the same year, as follows:—

	Ft.	In.
Surface, sandstone and shale.....	247	....
Coal .....	1	10
Shale and sandstone.....	134	3
Coal .....	2	8
Splint .....	....	4
Shaley coal .....	5	....
Shale .....	21	1
Shale .....	4	7
Coal .....	1	10
Shale .....	6	.....
Coal .....	2	....
Shale .....	54	7
Coal .....	....	6
Shale .....	6	.....
Coal .....	2	3
Shale .....	7	9
Coal .....	2	6
Shale .....	25	10
Coal .....	1	10
Shale and sandstone.....	25	5
Coaly shale .....	1	9
Shale .....	27	.....

A fifth hole was bored during the same year, 700 feet east of the Main street of Port Hood, upon the hill immediately in the rear of the Old Smith Hotel, as follows:—



	Ft.	In.
Surface material, sandstone and shale .....	207	1
Coal .....	....	4
Sandstone and shale .....	15	...
Coal .....	2	8
Shale .....	60	....

The Inverness Field is thus interrupted by older rocks; and the contiguous submarine field is obviously similarly, but perhaps less extensively affected.

The lowest measures of the coalfield outcrop at Ragged Point, Little Judique, on Lower Carboniferous strata. The coast of the island is thereafter Lower Carboniferous or Lower Carboniferous Metamorphic to about 4 1-2 miles Southwest of Long Point; thence the coast is Devonian to Hastings, where bituminous shales are exposed. A Carboniferous basin then occupies fully twenty-five miles of the littoral of the Straits of Canso. The Richmond coalfield, situated in this Carboniferous depression has not been completely explored; its exact dimensions are therefore still undetermined (although more than \$100,000 has been expended in investigating it.) The delay in the elucidation of these coalmeasures is perhaps, owing to the swampy character of much of the district, the thickness of the local boulder clay, the limited number of coal exposures, the complicated faults radiating N. W., S. W. and E. from the Estuary of River Inhabitants, and the contiguity of the Sydney Field.

The known productive measures extend around and (doubtless) under the Estuary of River Inhabitants. Two ascending sections at Little River and Seacoal Bay are given below; that at Little River is by Mr. McBean, of the Vale Colliery, Pictou; the other, by Mr. Hugh Fletcher, of the Canadian Geological Survey, begins at the mouth of the brook on which the mine is situated, 27 yards north of the Bridge.

LITTLE RIVER.				SEACOA BAY.			
	Ft.	Ft.	Ft. In.			Ft.	In.
Coal	2 to 8		5 ..	Shale and underclay....	15	...	
		Strata ..	45 ..	Coal said to be .....	4	...	
Coal	2 to 4		3 ...	Black and greenish shale,			
		Strata ..	60 ...	ironstone nodules .....	48	...	
Coal			4 ..	Greenish Argil, shale, iron-			
		Strata ..	154 ..	stone layers.....	23	...	
Coal			3 ..	Greenish grey sandstone.	3	...	
				" shale .....	2	6	
				" grey sandstone.,	3	6	
				" shale.....	3	...	
The Mines Report of the Government of Nova Scotia records the dip as N. E. 84° and the direction of the strike as N. W and S. E.				Black shale, coaly in places	10	...	
				Greenish grey shale .....	1	6	
				Black or dark shale .....	12	...	
				Greenish grey shale.....	7	...	
				Concealed measures .....	6	...	
				Dark coaly shales.....	2	6	
				Concealed measures .....	18	...	
				Grey coaly sandstone and			
				shale.....	20	...	
				Concealed measures .....	24	...	
				Dark and greenish shale			
				ironstone .....	17	...	
				Concealed measures .....		...	
				Dip S. 13° W. nearly vertical and overturned.			

At Coal Brook coal has been mined to a small extent in a seam said to be 3' 4" visible in the bed of the brook. Further down the brook possibly 3' 0" of coal and shale has been opened, and, lower down the brook, 80 tons of coal are reported to have been raised.

The "Richmond colliery," opened at Little River, A. D., 1860, was enlarged in 1863 by a shaft sunk between the 3' and 4' seams. These beds are excessively inclined, perhaps by a downthrow fault in the vicinity. The three foot seam was considered satisfactory, domestic, gas and smithy coal, but the 4' seam proved

inferior. From the shafts, level drifts were driven into each seam at intervals of about 40', and a lift of coal was taken off that height by driving a drift 6' high in the coal at that depth. After the drift reached a length of about ten yards, another 6' was removed above it, timber being put in and a scaffold formed near the "face" as it advanced. Another lift was taken out above in the same way, each "face" being kept regularly going; and as the coal was won it fell into the lower place from which it was removed to the shaft.

The following table shows sales of coal at this colliery :—

Year.	Sales, Tons.	Persons Employed.
1860	30	...
3	1100	32
4	1377	34
5	3584	..
6	870	24
1882	173	6

The mine was connected with a loading pier 380' long, near the mouth of Little River, by  $2\frac{3}{4}$  miles of tramway. The "Seacoal colliery" was opened 2 1-2 miles S. W. of the Richmond mine by an adit and shaft in a 4' seam, in 1860. The vertical thickness of the productive measures at that point, according to the lessee, was 1800', and they are on the same authority, said to hold eight coal seams 3'—11' thick, also several thinner. Two of them, viz: 4' of fair coal and 5—6' inclusive of a 15" parting appear to have been tested by drifts driven from a shaft sunk 42 feet through the boulder clay. One of the seams is said to have been mined for about 1600' along the outcrop at two points over a quarter of a mile apart. The quality is stated to greatly improve to the dip, also S. E. along the strike, a 9" shale parting in a 4' seam decreasing it is said to 1" in that direction; and the Big seam is stated to contain at least 6' of workable coal at a depth of 55 feet. The general strike of the strata is said to be N. 50° W. and the dip S. W. 70° decreasing to 60° one chain from the crop.



The following table shows sales of coal at this colliery:—

Year.	Sales, Tons.
1863	219
4	150
5	206
6	92

For latest official record of mining in the Richmond coal field, vide Mines Report, N. S., 1908.

The following borehole was drilled at Mines Road, about half a mile from the railway station, about 300 feet N.W. of a shaft, on what is known as the "Three Foot" seam, in A. D., 1906:—

	Ft.	In.
Shale and sandstone .....	166	7
Coal .....	.....	10
Shale .....	3	..
Coal .....	.....	8
Shale, dark .....	2	1
Shale, sandstone & 7' 7" conglomerate to bottom		
Total depth of hole.....	566	2

The following hole was bored, 20' from Little River and 234' N. 35' E. of the above, in 1908:—Dip of strata 45°.

	Ft.	In.
Surface, clay and shale with dirty coal .....	33	..
Shale, ironstone, sandstone, claystone .....	134	..
Black shale with a little coal .....	3	...
Shale and sandstone .....	134	..
Shale and coal.....	1	...
Sandstone, shale and some conglomerate.....	62	...

A hole was bored in 1908, 424 ft. 6 in. at Lower River Inhabitants, 1600 ft. N. E. from where the Richmond Railway crosses the highway between Mines Road Station and Lower River Inhabitants, in shale, claystone and marl, marl or limestone some gypsum and sandstone.

The following hole was bored at Mines Road, 2300 feet N. 70° E. of the hole bored 20' from the bank of Little River, in 1908:—(Dip of strata 37°, 50° S. of E.)

	Ft.	In.
Surface, shale, sandstone, perhaps some clay & claystone.	448	...
Shale, with white fibrous gypsum in bedded planes ... ..	53	9

Measures containing some coal are exposed at Upper River Inhabitants within three-quarters of a mile of the Pre-Carboniferous hills at the headwaters of the river. The detailed section as compiled by the Geological Survey of Canada appear in their Report in A. D. 1879-1880.

The Carboniferous basin holding the Richmond Coalfield is bounded on St. Peter's Bay by an exposure of Dolerite, beyond which the coast of the island is Pre-Carboniferous to the S. E. margin of the Sydney Coalfield, (Scatarie Island.)

Cape Breton, may be regarded as a succession of roughly parallel, Pre-Carboniferous valleys, in which Carboniferous measures have been extensively deposited. The excessive erosion to which they have been subjected, has reduced the land area of their productive division to relatively small districts; but richer tracts of accessible coal have been preserved (below the level of this excessive erosion) on the submarine slopes of the island.

# Analyses of Cape Breton Coals.

The following analyses of Cape Breton coals were published in A. D., 1902 :—

## SYDNEY FIELD.

SEAM OR MINE.	Fast or slow coking.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.	Sulphur.	Spec. Gravity.	Theor. Evap. Power.
		p. c.	p. c.	p. c.	p. c.	p. c.		
Hub seam .....		29 10	65 50	4 50	3 29	.....	.....	.....
“ .....		28 62	68 14	3 24	2 29	.....	8 59	.....
Block House seam .....	S	600 29 48	65 57	4 35	2 63	1 292	8 97	.....
“ .....		31 94	62 79	5 27	3 76	.....	7 67	.....
Harbour seam .....	S	80 27 85	67 05	4 30	2 32	1 29	9 19	.....
“ International Colliery .....		34 09	62 92	2 99	2 26	.....	7 76	.....
“ Glace Bay .....		30 21	67 78	2 01	90	.....	9 31	.....
“ .....		37 96	54 84	5 60	4 03	.....	.....	.....
Victoria seam .....	S	28 28 61	67 61	3 50	2 84	1 29	9 27	.....
“ .....		38 70	58 40	2 90	.....	.....	8 02	.....
Sydney main .....	S	3 04 31 14	61 50	4 32	1 24	1 30	8 45	.....
“ .....		8 13 23 81	67 57	5 49	.....	.....	9 25	.....
Sydney Colliery .....	S	1 26 33 84	60 79	4 12	1 71	1 312	8 33	.....
“ .....		32 74	61 54	5 72	3 37	.....	8 49	.....
McAulay seam, Gowrie mine .....		36 25	58 05	5 70	2 34	.....	7 97	.....
Gowrie Colliery .....	S	50 28 13	66 01	5 36	2 71	1 31	9 05	.....
Phelan seam, Caledonia Colliery .....	S	92 28 63	64 02	6 43	1 11	1 33	8 78	.....
“ .....		33 00	57 37	9 63	.....	.....	7 88	.....
“ .....		28 02	68 05	2 19	1 72	.....	.....	.....
“ Reserve Colliery .....		32 00	63 93	5 95	1 33	.....	.....	.....
“ .....		37 26	58 39	4 35	2 06	.....	8 02	.....
“ .....		1 00 36 26	.....	4 35	2 47	.....	.....	.....
“ .....		34 50	59 50	6 00	.....	.....	.....	.....
“ .....		52 34 21	59 73	5 54	1 25	1 28	8 19	.....
“ Dominion No. 1 Colliery .....		25 13	71 22	2 73	1 10	.....	.....	.....
“ Old Bridgeport .....	S	31 81	63 86	3 09	1 33	.....	.....	.....
“ Clyde Colliery .....		32 82	64 33	2 85	2 17	.....	7 88	.....
Lingan seam .....	S	75 34 61	61 39	3 25	1 35	1 29	8 42	.....
“ .....		30 03	66 90	3 07	77	.....	9 07	.....
South Head seam .....	S	1 77 28 00	62 26	7 97	2 64	1 38	8 53	.....
Emery seam .....	S	65 32 21	63 49	3 65	2 41	1 29	8 70	.....
Ross seam, Schooner Pond .....		38 10	58 46	3 44	1 21	.....	8 03	.....
Collins seam .....	S	1 98 26 16	66 48	5 40	2 25	1 311	9 10	.....
Gardiner seam .....	S	31 96	65 22	2 82	1 18	.....	.....	.....
“ .....		34 33	61 97	3 70	.....	.....	8 51	.....
Lorway seam .....		34 84	55 98	13 28	6 27	.....	8 02	.....
Tracey seam .....		2 23 30 09	66 61	98	.....	.....	.....	.....
Fraser seam .....		31 40	62 40	6 20	.....	.....	.....	.....
Carroll seam .....		32 80	61 40	5 80	.....	.....	.....	.....
Block House seam .....		38 80	55 80	5 40	.....	.....	7 67	.....



## INVERNESS FIELD, N. S.

SEAM OR MINE.	Fast or slow coking.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.	Sulphur.	Spec. Gravity.	Theor. Evap. Power.
Chimney Corner .....	F	8·19	26·39	57·70	7·72	....	....	....
Broad Cove, 7-foot seam .....	S	4·02	20·17	70·41	5·40	....	....	....
“ .....	S	7·24	25·75	56·86	10·15	1·41	....	7·61
“ 5-foot seam .....	S	7·78	27·67	52·87	11·68	....	....	....
“ 4-foot seam .....	S	8·45	28·36	56·94	6·25	....	....	....
Port Hood .....	S	2·54	29·82	61·93	5·73	5·54	....	8·49
“ 7-foot seam .....	S	4·02	34·86	53·60	7·52	....	....	....
Port Hood mines, face of slope depth of 1,150 feet .....	....	2·11	68·36	49·25	9·78	....	....	....
Port Hood mines, face south level .....	....	2·47	38·48	50·39	8·66	....	....	....
“ “ face north level .....	....	2·42	37·18	50·96	9·44	....	....	....

## RICHMOND FIELD.

Sea Coal Bay, 11-foot seam .....	....	....	25·20	44 70	30·10	....	....	....
Little River, 4-foot seam .....	....	....	30·25	56·40	13·25	....	....	....

## CHAPTER VII.

Cape Breton is separated from the mainland by a picturesque channel, excavated by the currents of the drift period. The western side of the Straits is occupied by Devonian and Lower Carboniferous rocks, which extend through the Maritime counties of Guysborough and Antigonish.

An 8" to 1' seam of coal was discovered on Taylor's Brook, Pomquet Harbor, in the latter county, prior to A. D. 1836; and several pits have been dug, presumably upon it, at Peter Dion's. The coal, at that point dips N. 24 degrees, W. 20 degrees, and where seen in pieces, on the shore, appears to vary from a bright good to a very pyritous variety. A boring in the water, near the bank is said to have cut coal.

The lower Carboniferous or Devonian, bituminous shales at Hallowell Grant, Big Marsh and Cape George, Antigonish, which are said to be similar to those at Horton Bluff, in King's County, have been mistaken for coal. These shales often pass into or include layers of fairly good coal; they break with smooth polished faces, and they are stated to be so rich in bituminous matter that hopes are entertained of distilling them for coal oil. They underlie the carboniferous limestone at Big Marsh, and have been there divided into two groups; the lower 70 feet thick, includes 20' of oil shale, 5' of which is curly richly oleaginous cancell— the upper, also rich in oil, is 150 feet thick.

Similar deposits exposed on the north side of East Bay, on the contiguous island of Cape Breton have formed the object of economic enterprise. A number of beds have been traced for several miles through that district, and the following results are said to have been attained on working tests:—

Kerosene Oil .....	1.25
White Spindle Oil .....	1.25
Heavy Lubricating Oil.....	2.50
Pitch .....	1.25
Water .....	5.75
Coke .....	87.50
Loss, gas, etc.....	50

As early as 1868-9, \$1270 had been expended in exploring the Antigonish shales, for coal. A long tunnel has been driven, at the brook half a mile east of the Big Marsh Post Office, into a seam, from which coal is said to have been taken. Up the west branch of a very small brook west of the long tunnel a seam said to be 5' thick, dips westward and a considerable quantity of coal is said to have been extracted from it. The continuity of this seam is said to be broken off both east and west of the brook. The coal though sometimes resembling cannel, was, for the most part a hard, bituminous variety, streaked with pyrites and somewhat shaley, lenticular or crushed. Some operations were carried on at the little brook, less than a quarter of a mile North east of the Post Office at Big Marsh in 1907-8; a sample from the workings, analysed for the Mines Department yielded:—

Moisture .....	2.25
Volatile Combustible Matter .....	23.28
Fixed Carbon.....	47.54
Ash .....	26.93
<hr/>	
	100.00
Sulphur .....	3.15

Other samples yielded by fast coking:—



	I	2
Water .....	1.12	.66
Volatile Combustible Matter.....	21.58	28.39
Fixed Carbon .....	30.84	41.55
Ash .....	46.46	29.40
	100.00	100.00
Coke, strong, compact .....	77.30	70.95
Ratio of Volatile Combustible Matter to fixed carbon	1:1.43	1:1.46

The sulphur of No. 1 (which was slightly pyriteferous) was not determined, no mention of the sulphur contents of No. 2 is made.

The following hole was drilled in search of coal, at Tracadie, near the shore of George Bay, in 1906:—

	Ft.	In.
Sandstone and shale .....	615	9
Shale, gray .....	10	3
Sandstone, gray.....	3	4
Sandstone, red.....	4	8
Sandstone and shale...		
Total depth of Hole .....	782	...

Two holes have been drilled for coal at Merigomish, in the adjoining County of Pictou, (A. D., 1907). No. 1 on the property of John D. Simpson, about 300 feet south of where the old house now stands, as follows:—

Surface, shale, sandstone and 7' 4", conglomerate and shale:  
Total depth, 770 ft. 0 in.

No. 2 Hole, about  $\frac{3}{4}$  of a mile N. E. of Merigomish Railway Station:—Surface, sandstone and shale, total depth, 536 ft. 0 in.

A tolerably regular 12-18 inch seam of bright coal, streaked with mineral charcoal and pyrites dips seaward upon an 18 inch bed of fireclay in the neighboring Permian of Big Island, Merigomish. The contiguous coast as far as Cape John is occupied

by Permian strata in which thin coal seams have been found, near the top of the conglomerate towards the East River, near Deacon's Cove, on the Estuary of that stream, and elsewhere.

The Pictou Coalfield, one of the most unique Carboniferous deposits in the world lying immediately to the south, possesses, from its intimate connection with the political and industrial developments of Nova Scotia, a peculiar national interest. It extends for about 9 miles between New Glasgow and Stellarton, with a proved width of about three miles bounded on the south by iron fields. The contiguity of Pictou Harbor and the Maritime mainlines, afford outlets for the collieries at all seasons of the year; and the ironfields in the older rocks which bound the field on the south will doubtless unlimately create a large local demand for their metallurgical fuels.

\* \* \*

It has been suggested that the curious and interesting name "Pictou" originated from the combustion of coal discovered under 4 feet of burnt clay and ashes on the East River. The Indians had a traditionary account of a fire at that point; and as "Bucto" signifies fire in the Mimmac tongue it has been conjectured that "Pictou" is a corruption of that word, in that connection. An authority on the Micmac language has further stated that "Pict" means an explosion of gas; and he suggests that the name "Pictou" was given to this important district owing to the escape of natural gas from the coal underlying the East River,—a phenomenon noticed and utilized by the mining classes as late as 1827. Patterson in his history of Pictou has, however, pointed out that the phenomena of the charred coal and gas appeared only at the East River, whereas it seems certain that the name "Pictou" was specially applied to the north side of the harbor on which no such phenomena existed. It is probable that the district has derived its name from "Bucto", a word applied by the Indians to a portion of the West River where one of their large

encampments was burned, during their absence on a cruise down the harbor. It is interesting to note that these theories derive the name of this coalfield from fire; and the application of such a name to a district which has been the scene of the worst colliery disasters in Nova Scotia may be regarded as a curious coincidence.

\* \* \* \* \*

The productive measures of the Pictou coalfield an almost continuous section of which is exposed on McLellan's Brook, are affected by faults. The known worked seams are gaseous, and some of the coal has discharged more explosive gas than any other Nova Scotia mines. From the freshly cut coal, of a Pictou colliery ventilated by 10,000 cubic feet of air a minute, gas has issued, pure enough to extinguish the flame of a safety lamp held in it; and a pair of levels in solid coal has yielded sufficient gas to foul a current of 19,000 cubic feet of air per minute. Workings of the old collieries have been found infested with black damp; cars harness, canvas cloth, tools and even hay, lost for 20 years, have been recovered from the Deep Seam winnings, well preserved by this noxious element, and when the "Burnt Mines" were re-entered in 1849, the explorers waded through black damp, with inflammable gas overhead.

The variation in the character, thickness and quality of the Pictou seams is very marked; from numerous analyses it appears that their composition varies in the benches as well as various districts of the same seam.

The product of the collieries, less bituminous than that of the "Sydney" coalfield, is however, considered specially adapted for steam raising, and in some cases, for metallurgical purposes.

The principal mining operations are carried on in the Albion, Westville and Vale sections, in which the chief seams are:—



ALBION DISTRICT. Dip horizontal to over 30° Geo. Survey.	WESTVILLE DISTRICT. Similar variation in dip. †rummond Section.	VALE DISTRICT. Dip at Vale Mine 28-30°
Ft. In.	Ft. In.	Ft. In.
Main Seam.... 34 7	Main (Acadia) 17 ...	"Six Ft." 3 ft. to 6 ..
Strata...148 ...	Strata...184 ...	Strata .700 ...
Deep Seam.... 22 11	Second Seam. 12 ..	McBean 6 ft. to 7 6
Strata...106 ..	Strata...107 ..	
Third Seam... 5 7	Third Seam... 6 ..	
Strata...113 ..	Strata... 90 ..	
Purvis Seam . 2 6	Fourth Seam	
Strata...130 ...	(Poor) ..... 8 ...	Bottom of Basin reached about 2500 ft. down slope on the "6 foot" seam.
Fleming Seam 3 3		
Strata... 4 3		
McGregor.... 11 7		
†Strata...211 7		
*Stellar ..... 5 ...	*Section at one point	
Strata... 15 ...		
"A" (impure) 11 ...		
Strata...110 ..		
"B" ..... 2 ..		
Strata... 75 ...		
"C" ..... 10 ...		
†Strata...133 ...		
"F" ..... 4 ..		
Strata... 9 ...		
"G" ..... 2 ...		

	Ft.	In.
{ Inferior Coal	1	2
{ Oil "	1	8
{ Bituminous Shale	2	...
	4	10

None of the seams from A to G of the Albion section have been proved to be of commercial importance.

These sections must be read in connection with the Author's reference to the variation in the character and thickness of the Pictou seams.

†Includes coals D and E 6 inches each.

‡Contains an impure 4 ft. 6 inc. coal seam.

On the last day of the election to the Nova Scotian Legislature in the year 1799 the local candidates were entertained to dinner by a Pictou gentleman who had made for them the then curiosity of a fire of native coal. From this time a little coal was regularly mined, and the local smiths commenced to bring down







quantities in lighters to Pictou for their own use; but there is no accurate record of the sales prior to A. D. 1815, although John MacKay (Collier) obtained a license to mine in A.D., 1807, and later to export coal. McKay opened the "Main" seam on the west side of the East River and lightered coal down the East River for shipment to Halifax; but his operations ended in insolvency owing to a decrease in the demand for coal at the close of the Anglo-American War of 1812.

"Pictou Colliery" was then leased to Edward Mortimer, who acquired an area on the east side of the river, in 1818; but on Nov. 3rd, 1819 both properties were leased for 20 years to Mr. George Smith (who paid the arrears of £1176.4.1 then due to the Crown), on the following terms:—

(1) For the mine on the west side of the East River £260 per annum and three shillings per 36 Bushel chaldron on coal mined in excess of 1400 chaldrons. (2) For the area on the opposite side of the river £110 annually up to 1733 chaldrons of 36 bushels and three shillings per chaldron on coal mined in excess of that quantity.

In 1820 the properties were sub-leased to Adam Carr, who worked the "Main" and 3' 8" of the lower section of the "Deep" seam west of the East River. The "Main" winnings extended towards the River; and, in 1827, the colliery had an estimated capacity of 10,000 chaldrons of coal per annum for the remainder of the lease. The cost of production and the market price of "Pictou" coal at that time were:—

	Cost Per Chaldron		Price Per Chaldron	
	s.	d.	s.	s. d.
Rent and royalty	4	...		
Mining	3	...		
Blacksmith & tools	...	9		
Pit Timber	...	3		
Haulage ex-mine & maintenance of horses and carts	1	9		
Cost at Pit mouth	9	9	Pit Mouth	10 to 13.6
Cost at River side	12	9		
Cost at Loading Ground	15	...		
On wharf at Pictou			20	9

The entry of the General Mining Association into Nova Scotia disturbed these pioneer operations; and, in 1827, the lessees, dreading the competition of that corporation, surrendered their leases to the Crown at an estimated loss of £5,000. The Mining Association immediately leased Pictou Colliery from the Imperial Government, compensated the retiring lessees for the material and stores upon their premises, and used the existing shaft and level to the river during the sinking of the "Store Pits." When the "sinkers" struck the "Main" seam at 180—200 feet, water flew out of it, depositing a "kind of mineral fermentation," roaring gas hurled pieces of coal off the wall with an explosion like the report of a pistol, and a deafening noise, "like a hundred thousand snakes hissing at each other" filled the shafts. The East River, over the crop of the seam, boiled, and when ignited with a torch on a calm day, became literally on fire.\* The miners' wives, to profit by this curious phenomenon, dug holes in the river bank, filled them with pebbles, lit the gas with a candle, and there boiled the hot water they required for a family washing. The pits were united by a headway and ventilated by a water blast, i. e., a large hogshead with a perforated bottom, was placed near the top of the "Engine" Pit, and the water pumped from the mine was allowed to run back into the shaft, through the hogshead. This caused the air to descend the "Engine Pit" and impelled it to the "return" or "winding shaft," through an air course (or "trumpeting") cut in the side of a way gate, driven at right angles with the crop. The ventilation was, however, subsequently improved by a small shaft sunk near the crop, and as the workings progressed, similar shafts were continued along the crop. The gas, however, decreased in the mine and ceased to rise in the river as the coal was opened up. Coal was raised from 12' of the upper part of the seam on September 6, 1827, by primitive horse gins; but in December the Mining Association erected a 20 H.P. hoisting engine, which, in the language of the day, "brought into successful requisition in Nova Scotia, the immense

\*According to Dr. H. S. Poole this fluvial gas issued from the underlying Deep Seam.

power of steam." The coal was shipped over a horse wagon-way, laid with rails cast at the colliery, to shoots, below New Glasgow, where vessels drawing 6 feet of water could load; and it was lightered from that point to larger tonnage at the river mouth. The elevation of Pictou to the status of a Free Port in A. D., 1828 increased the demand for coal to 6210 chaldrons, in A.D. 1829. In A.D. 1833 the Canadian steamer, "Royal William," 1,000 tons burthen and 180 H. P., built at Three Rivers and engined at Montreal, bunkered in the Port for London, England, thus inaugurating the steam navigation of the Atlantic with Pictou Coal.

Six years later (A.D. 1839) the first railway in British America, equipped with three Hackworth locomotives, was opened from the Mines to the Loading Ground, amid great public excitement. Two steamers towing lighters carried 2,000 people from Pictou to New Glasgow, from which place they proceeded by train to the colliery, where crowds of people, afoot and on horseback, assembled from all parts of the country. A procession of the various local trades, the Masonic Lodges, the Pictou Volunteer Artillery Co., and mounted visitors, then marched with pipers, bands and banners to New Glasgow and back to the mine; three trainloads of passengers were hauled by the engines to New Glasgow and back, delighting the people with the novelty of a railway journey; and the celebrations terminated with feasting and festivities, to which, in the language of the day, every fiddle and bagpipes from Cape John to the Garden of Eden contributed.

The average number of persons employed at the Albion Mines about that time, (1838), consisted of:—

Resident Manager.....	1
Clerks, bailiffs and overseers..	9
Coalcutters .....	146
Engineers and Fireboys.....	18
Carpenters, masons and assistants....	54
Blacksmiths.....	8
Sawyers, ostlers, saddler and groom .....	8



Surface drivers.....	43
Underground drivers and laborers .....	66
Pithead men.....	20
Pick carriers.....	6
Surface laborers.....	78
Wharfsmen.....	4
Brickmakers.....	40
Plaisterers.....	5
Farmers.....	2
Shipwrights .....	10
At Loading Ground.....	50
In foundry.....	40
On steamers, Albion and Pocahontas.....	11
On South Pictou Railway.....	296
Total number persons.....	915

Forty-nine horses were employed above and fifty-two underground; and the steam plant, then perhaps to Nova Scotia the most interesting feature of the new operations, consisted of seven winding, pumping and other engines aggregating 183 H. P., one 16 H. P. engine at the Loading Ground and three 30 H. P. engines on the steamers.

The fixed charges of the collieries in September 1838, exclusive of wear and tear, interest on capital and Crown rentals were:—

	Per Chaldron.	
	s.	d.
Pit Charges	8	7 1/2
Material	...	4
Sundries	...	10
Salaries	...	8
Carriage etc.	...	8 1/4
Re-shipping	...	11
£0. 12.		03 3/4

The history of the "Store Pits," is a record of subterranean fire and disastrous explosion. They exploded as some of the earliest "shifts" were descending the shaft, which is stated to have

been "full to the mouth with gas." They were maliciously fired on December 29th, 1832, and had to be flooded with the East River; they ignited after a shot in A.D. 1834; exploded in A.D. 1836 and 1838; and they had to be abandoned with thirty or forty horses, after another conflagration in A.D. 1839. Only 40 acres of the upper 12' of the Main seam had then been wrought. Blowers of gas, one of which burned with a flame two feet long, from the end of a one inch diameter copper tube for six weeks, appear to have been particularly troublesome at this colliery.

The "Bye Pits," were sunk (1839) to the dip of, and ultimately connected with the "Store Pits" to continue the winning of the upper 12' of the Main seam, east and west.

The "Special Rules" then in force at the Pictou Mines, were:

Rule I. The overman and at least one of his deputies or assistants, shall examine all the bords and other working places every morning before the colliers go down. They shall meet the colliers and other workmen at the bottom of the shaft and if they have found any gas or other cause of danger in any of the bords, shall caution the colliers belonging to such bords and give them such instructions as they deem necessary.

Rule II. Whilst the pit is at work an overman or deputy shall always be present at each face of the works, viz: One on the north and one on the south side, so that in case of an alarm of fire or any accident, the overman or deputy shall always be at hand or within call.

Rule III. When the day's work is finished the overman or his deputies shall remain in the mines for the purpose of going through every bord and carefully examining them after the colliers have left, so that no blower of gas may be left burning or any fire concealed amongst the fallen coal.

Rule IV. Every bord shall be furnished with a fire bucket, marked with the number of the bord, a coarse bag for beating out

gas, and a tub or open-headed cask to contain 40 or 50 gallons of water. The fire bucket and the bag shall be in charge of the colliers of each bord, who shall pay for, or replace them, if lost.

Rule V. Every panel consisting of six bords shall be furnished with a small cannon which shall be kept at some convenient spot in the lowest bord. The overman and deputies shall keep the cannon clean and dry and ready for use. They shall also keep the tubs constantly full of water in each bord.

Rule VI. Every bord shall at all times be furnished with a safety lamp, which shall be examined by the overman at least twice a week, and in case of injury being done thereto, more than common wear, the cost of the lamp shall be charged to the colliers in whose care it is placed.

Rule VII. Any collier meeting with a cutter or fissure which yields gas, or with anything unusual in his bord, shall immediately report the same to the overman or deputy.

Rule VIII. No collier shall be allowed to put in more than one shot or blast at a time, into any bench or fall without permission from the overman.

Rule IX. After blasting either a fall or bench, the coal shall be turned back, so that no fire may be concealed amongst the loose coal, and before the colliers leave their bords they shall be careful that no blowers of gas are left burning.

Rule X. No collier shall work in any fiery bord unless there are other colliers working in the adjoining bords at the same time.

Rule XI. The coal shall not be blasted, or a naked light used on any pretence whatever in any bord or working place in which the overman has forbidden gunpowder or naked lights to be used.

Rule XII. Every person employed in the pits on passing through any air door or trap door shall always close it after him.

Rule XIII. No person shall unscrew his safety lamp (where such are used) excepting when and where he is ordered or directed to do so by the overman or his deputy.



Rule XIV. When a blower or body of gas is fired by a shot, or otherwise, which cannot be at once extinguished by the ordinary means, notice shall be sent without delay, to the overman or deputy; and in the meantime, the colliers from the adjoining bords shall be called in to give assistance.

Rule XV. On the arrival of an overman or deputy at the fire, all the colliers and other persons who may be present or sent for shall act under his orders, and use every exertion to carry them into effect.

Rule XVI. The extinguishing engine shall be kept in a proper house, near the pit top, and a bell of not less than 28 lbs. weight, shall be hung upon the pit frames at No. 1 shaft, with a rope leading to the bottom of the shaft, for the purpose of making signals from below, without loss of time.

Rule XVII. The overman or deputy, on his arrival at a fire, shall, if he considers it necessary, cause the bell to be rung for the extinguishing engine, and to give notice to the manager or deputies, or other persons who may be on the surface, whose duty it is to be present, that they may immediately go down.

Rule XVIII. In all cases of a fire a most determined effort must be made with the extinguishing engine; beyond this it is impossible to frame any rules that will apply generally. The manager and his assistants must then decide what further measure to adopt.

Rule XIX. The overman, or the deputies who shall have gone through all the bords after the workmen have left the mine, shall report personally to the manager, the general state of the works, and particularly whether the cannon, buckets, water, tubs, etc., are all in readiness for any emergency, and in case the manager shall be absent they shall enter their report in writing in a book kept in the office for that purpose.

Rule XX. No deputy shall at any time, whilst on duty in the pits, during working hours, leave his appointed station until

relieved by another deputy, to whom he shall report the state of the works under his charge, together with any instruction he may have received from the overman.

Rule XXI. At all times whether there is any apparent danger or not, the foregoing rules shall be strictly adhered to, without the slightest relaxation, their object being to protect the lives of the workmen, as well as the works themselves, and any person neglecting or in any way evading them, shall, if the manager thinks proper be dismissed from the service.\*

\* \* \* \*

In 1842 the Mining Association called the attention of the Crown to the imposition of an American duty of \$2.20 per Winchester Chaldron upon Nova Scotia coal, and to the completion of strategic American railways for the haulage of American coal into the New England markets of the Nova Scotia mines. These changes seriously affected the provincial coal industry. Shipments of Pictou coal to the United States declined from 21,076 chaldrons in May, June and July to 8,404 chaldrons during the last 5 months of 1842; and the Mining Association's American customers decided that it would be more profitable to burn native anthracite coal than Pictou coal.

This was a serious check to the development of the foreign coal trade of Nova Scotia—the trade upon which the Provincial mines absolutely depended. The Provincial house coal market was not large, and the manufactures of Nova Scotia were then extremely simple. Coarse cloth, sometimes of handsome patterns, woven by the farmers' wives and dyed at home, or in the fulling mills of the older townships, still formed the staple clothing of the people. Flannel, bed linen, woollen blankets and carpets were also made in the home instead of in factories, which would have stimulated the consumption of native coal. Power looms were unknown; and the tanneries (usually merely hogsheads or pits sunk by the roadside), sawmills, stove and chain factories, the producers of iron fittings for the farms, mills and shipyards of

\* For Blasting Rules now in force in Pictou, see page 160.

the Province; and the established manufacturers of household furniture, carts, carriages, ploughs, buckets, barrels, boxes and other wooden products, tobacco, confectionery, printing and wrapping paper, hats and bleached grass bonnets, etc., did not in the aggregate consume sufficient coal to support the costly modern collieries established by the Mining Association.

The fixed charges of the Albion Mines were reduced to the lowest possible point, and the price of coal to a figure which left no profit, to compete with American coal in New England; and a further reduction in price being necessary to compete successfully in the American market, the Mining Association asked the Crown to authorize it to raise 50,000 instead of 20,000 Newcastle chaldrons of coal, for the rental of £3,000 sterling per annum—the royalty of 2s. currency to be applicable to all shipments in excess of 50,000 chaldrons. The Crown, believing that the late increase in the English coal export duty, counteracted to a certain extent the injurious effects of the United States coal duty upon the Nova Scotia coal industry, declined to reduce the Mining Association's obligations, but authorized it to mine 20,000 additional Newcastle chaldrons of coal, free of royalty, during A. D. 1843.

The price of Pictou coal in the United States was thereupon reduced; but the Association still found itself unable to compete with Pennsylvania, in the North Eastern States, and, the directors again (1844) petitioned the Crown to allow them to mine 50,000 chaldrons (Newcastle) of coal under the lease and to make further shipments subject to a royalty of 2s. currency per Newcastle chaldron.

Meanwhile (1838 and 1844) Abraham Gesner, M. D., had complained to the Legislature of Nova Scotia that the Association's \*monopoly prevented him and others from deriving any advantage from the minerals of the Province, and that fuel was consequently becoming increasingly scarce in western Nova Scotia. Gesner pointed out that the inhabitants along the shores of Minas Basin

\*Vide page 13 and p. 130, line 5.



and Cumberland could be economically supplied only from the Cumberland coalfield; and, with that object, he applied for a lease of the South Joggins Coal Mines, for which he offered to pay at the same rate as the Mining Association were paying at Pictou and Sydney Mines. Anticipating that the Mining Association had no available capital he urged the Legislature to immediately serve notice upon them to open a mine in Cumberland within the next twelve months, pointing out that under the Imperial lease their neglect to do so would forfeit the South Joggins coal to the authorities who would then be in a position to lease it to him. Dr. Gesner further directed public attention to the tardy development of the minerals of Nova Scotia, under the existing conditions; and in the press at home and abroad, he predicted that the Province would never thrive until her resources were liberated from the "fetters of unyielding monopolists."

This agitation was supported by Kings and Colchester\* counties, who presented nine petitions hostile to the Mining Association, to the House of Assembly, and the sympathies of other parts of the province were enlisted. The monopoly of Nova Scotia's most valuable minerals conferred upon the Association by the Imperial Government consequently became the object of a Legislative inquiry at Halifax; and on March 15, 1845, a Committee of the House reported that the facts elicited from Dr. Gesner and Mr. John W. Dawson, on the extent and income likely to be derived from the Provincial coal fields if the Legislature controlled them, must create a strong desire that they should be relieved from a monopoly pressing heavily upon the people.

The Committee contended: (1) That the Nova Scotia Government had lost £52,262 in 1841-2 and 3, because the Pictou and "Sydney Mines" collieries had been leased to the Mining Association at lower rates than those paid by Smith and Messrs. Bown up to A. D. 1826; (2) That notwithstanding the lower rate paid by the Association, the Pictou coal consumer was paying 16s. 6d.

\*For the indebtedness of Nova Scotia to a Colchester gentleman (Hon. B. F. Pearson) in later years, vide page 67, etc., seq.

per chaldron for coal sold by its predecessor for 13s. 6; (3) That foreign consumers were more favorably treated than the home consumer; that cargoes of Nova Scotian coal had often been bought cheaper in the United States than at the mines; and (4) that because the Mining Association would neither open mines in the Western counties, nor allow others to do so, a large portion of that part of Nova Scotia was deprived of convenient coal supplies.

The Committee, therefore, disapproved of any reduction of the General Mining Association's responsibilities to the Province by the Imperial Government, and suggested that if the company could not operate the Pictou and Sydney Mines collieries upon the existing basis, the House of Assembly might offer to buy them. The further suggestion was made that the Legislature should endeavor to restrict the Mining Associations existing monopoly to the Pictou and Sydney Mines districts or assert the right of the Nova Scotian Legislature to control all the mines which the Association refused to work.\*

For the next twelve years the House of Assembly objected to the General Mining Association's monopoly; and on January 1, 1858, (control of the minerals of Nova Scotia having been vested in the Legislature by the Crown) the unpopular Imperial franchise was surrendered by the directors of the Company for a Provincial lease to August 25, 1886, of eighteen square miles of coal on the north, and fourteen square miles on the south side of Sydney harbor, two square miles of coal at Bridgeport, four square miles, including the Albion mines in Pictou County; and, in Cumberland, four square miles at the Joggins, and four at Springhill. The royalty payable to Nova Scotia was fixed at four and eight-tenths of a penny per ton of 2240 lbs. upon large coal sold, up to 250,000 tons, and three and two-tenths of a penny per ton upon further sales; slack or small, and coal consumed at the

\*The creation of this monopoly of the Nova Scotia coal fields in favor of an English corporation—one of a series of ill judged interferences with the early coal trade of the province by the Imperial Government—was regarded in the United States as an illustration of the disadvantages of colonial connection with Great Britain.

†Vide page 16.

mines or by the company's servants was exempted from royalty. Nova Scotia further agreed that no export duty would be imposed on coal exported to foreign markets. Meanwhile, although the abolition of the British coal export duty, had facilitated the competition of "old country" coal in America, the affairs of the Mining Association had so far improved that a small dividend was for the first time paid to its shareholders in 1846; and in 1847 Pictou Harbor was thronged with tonnage engaged in the reviving New England coal trade.

The unusual demand for small colliers during that year forced Boston freights from \$2.50 to \$3.75 per chaldron; but the stress of shipping caused ruinous detention to tonnage at the Pictou "Loading Ground." One hundred and eight American colliers were detained during the latter part of the season, on an average twelve unnecessary days (some as many as twenty-nine days) at an estimated loss of £5,184.

The total repeal of the American coal duty in 1854, under the Reciprocity Treaty, further improved the Mining Association's prospects; and the settlement of its differences with the Legislature of Nova Scotia in 1858, as outlined above, established its operations upon a sound commercial basis. The Pictou mines then (1857) consisted of:—

Name.	Sunk.	Seam.	Depth, Ft.	Capacity, Tons.
The Bye Pits	1839	"Main"	451	200, large coal daily
Dalhousie Pit	1850	"	240	450, "
Cage Pit	1852	"Deep"	295	300, "

Section of Main Seam to the dip of "Bye Pit."

	Ft.	In.
Coarse coal.....	1	4
Good coal.....	4	4
Ironstone.....		2
*Good coal.....	20	6
Coarse coal.....	8	4
	34	8

\*With two ironstone ball partings  
2 inches to 10 inches thick.

†This bench became good coal in  
the dip workings.

A Section of Deep Seam.

	Ft.	In.
Coarse coal.....	2	
Good coal.....	3	7
Ironstone.....	1	1½
Very good coal.....	3	5½
Shale coal.....		8½
Good coal.....	3	9
Coarse coal.....		11½
Good coal.....	3	4
†Coarse coal.....	5	10
	22	11

These seams and the remainder of the "Albion Mines Section" deteriorate eastward of the East River. At the Pictou Pit all but 18" of the Main Seam is black shale.



The operatives consisted of :—

Underground.		Surface.	
4	Overmen	3	Managers and Clerks
197	Cutters and Loaders	2	Bailiffs
3	Bottomers	6	Carpenters
2	Enginemen	12	Blacksmiths
7	Incline Boys	5	Breakmen
19	{ Trappers Way Cleaners	4	Founders
3		8	Enginemen
4	Ostlers	10	Locomotive Enginemen
4	Roadsmen	4	Coal Drivers
2	Watchmen	4	Masons
2	Furnacemen	40	Laborers
46	Drivers	8	Wharfsmen
		2	Shipping Officers
		1	Gatekeeper
<hr/> 289		<hr/> 109	

Nine vessels could be loaded simultaneously at the Loading Ground, at which the shipping facilities were equal to 1200—1500 tons per day. Tonnage drawing more than 20 feet of water was usually loaded from lighters towed out to them in the stream.

The "Bye Pit" exploded at twenty minutes past ten P. M. on May 29, 1861. The workings were re-opened ten months later: but they were dangerously hot, and, the following year, the colliery again ignited.

In 1866 the "Forster" Pit was sunk to the "Main" seam near the "Dalhousie winnings" to obtain 500—700 tons more coal per day; but these operations proved disappointing as the coal deteriorated to a shaley textured, dull lusted seam, towards the west. The "Bye Pit" ignited the following year, during the driving of slants to forewin the "Foord Pit" area, and the winnings were flooded, and the "Foord Pit," then probably the most elaborate colliery in America, opened in the "Main" seam to the dip of the "Bye Pits" in A. D. 1869, immediately exploded. The "Foord" winning was recovered; but the "Forster Pit" ignited during the following year, and the fire penetrated into

"Dalhousie Colliery" and (1872) affected the "Deep Seam," through fissures opened in drawing the "Cape Pit" pillars. The affected district in the "Deep Seam" was, however, successfully isolated. The General Mining Association withdrew from the Pictou field in 1873, and disposed of its property to the Halifax company, which commenced business under the veteran guidance of the celebrated British coal operator—Sir George Elliot. While the new company was driving the rise bords of the Foord Pit, in October, 1880, one of them "holed" into a dip slant, driven as stated above, in the "Bye Pit" to forewin the Foord area, and the water lying above swept the tubs, rails, etc., left in the old colliery through the opening, killing six men. One month later (Nov. 12) the south side of the "Foord Pit" exploded about 6.30 a. m., and 44 persons, many of whom must have been waiting for their tools at the head of the dip slants, lost their lives. Seven men were rescued in a state of insensibility, and the colliers on the north side escaped through stone drifts driven from the "Foord" Pit to the Deep Seam, in 1875, but the working could not be preserved, and a second explosion even ignited the "Cage" Pit through the connecting stone drifts. This disaster completed the destruction of all the collieries established in the Albion district and the ruin of the works left an immense fire infested burrow holding roughly 10,000,000 tons of the "Main" seam.\*

Mining at the Albion collieries was regulated by the varying quality of the seam. The demand for selected coal to compete with British and American coals at home and abroad restricted the "Main" seam winnings in the "Store," "Bye," "Dalhousie" and "Foord" Pits to the "Upper Coal"; but Dalhousie Colliery was afterwards wrought in the lower and practically exhausted.

Five years after the loss of the "Foord" and "Cage" Pits, the Halifax Company, (having replaced the lost collieries by slopes on the "Third" and shafts on the "McGregor" seams, amalgamated with the "Acadia" and Vale Coal Companies, whose organization is about to be narrated, under the name of the Acadia

\*Vide "Fires in Pictou Mines," Proceedings Legislature of Nova Scotia 1896.

Coal Company, Limited. The new company opened the "Deep" seam by the "English Slopes," east of the "Cage" Pit in 1888; but the underlying "Third" seam was partially lost during that year by the fracture of the roof up to the burning colliery during pillar drawing.

According to the State papers of Canada, the relations between capital and labor at the "Acadia" Coal Company's collieries, about 1888, were: From the operators' standpoint:

"Company works four mines—Acadia, MacGregor, McBean and Six Foot. Over 900 men and boys employed, divided into day and contract men. Working at timbering, average wages \$1.30 a day; carrying coal, 60 to 80 cents; ages from sixteen to nineteen; some drivers get \$1. Coal-cutters, work by contract, at so much a yard or ton. Shovellers get \$1.30 a day, a few get \$1.20; average hours would be less than ten. Coal-cutters made \$704 in twelve months; average of men at shifts, something over \$400. Company own a number of houses, which rent from \$1.50 to \$2.50, and cost about \$650. Some of them are sixty years old. No stores are kept by the company. Is willing to advance money to steady men. There are often little disputes with the men. Last May was the last; cause, reduction of wages in one pit. Men in other pits refused to work if order was enforced, and quit work. They made proposition, which was withdrawn after. The company refused arbitration, and a compromise was the result. No men were refused afterwards in consequence. Has considerable amount of respect for men who are leaders in these matters. Some men have built houses for themselves. Has heard that some men have put money in savings banks or made other investments. Meat is cheaper in Stellarton than in Halifax. Charge \$1.60 for coal delivered to employees; outsiders \$2.50 at the shaft. Our men get it about half price. Fines per box for stone, 17 to 20 cents, which go to the company. Price for cutting coal is 38½ cents per cubic yard to 70 cents—a ton to a cubic yard, roughly speaking. Thinks men are generally satisfied and the bulk



sober. Think miners pay \$1 a head to public schools. Has not found it advisable to pay men oftener than once a month. No general fund for men in case of sickness or accident. Men now earning both more and less than in former years; as a rule are steady and sober. Boys under twelve not employed. No rule to pay in case of accidents. Monthly pay roll from \$24,000 to \$25,000. Company owns about 350 tenements. Houses built by men worth \$400 and \$500. Memorandum of Cutters' Fines and Wages at Acadia Coal Company's Works, March, 1888:

Number of Cutters.	Days on which Pit worked.	Days of 10 hours actually worked by Pit.	Shifts returned by Cutters (Note A).	Earning less loaders, powder, fines, &c.	Average wage per shift returned by men.	Assumed total possible shifts of 10 hours.
69	26	16 $\frac{3}{4}$	1,464	\$ cts. 2,644 49	\$ cts. 1 80 $\frac{3}{4}$	1,156
78	26	22	1,570	2,378 56	1 51 $\frac{1}{2}$	1,716
165	25	22	3,337	5,210 55	1 56	3,630

Extreme rate of wages by men working under similar circumstances:

In one pit ..... per shift \$0.91 and \$1.70

In another ..... per shift \$0.56 and \$2.83

In another.... per shift \$0.81 and \$1.81

Individual earnings in some cases per shift.....\$3.00

Note A.—This number includes short shifts of two hours and upwards, and also shifts allowed to comrades though not worked.

Memorandum furnished by Mr. Poole, showing amounts earned by three sets of cutters for seven months, ending 31st December, 1887:

## ACADIA COLLIERIES.

A.	93 cutters, net earnings for seven months .....	\$27,496	99
	Equal per cutter .....	278	66
	"    " month .....	39	79
B.	72 cutters, net earnings for seven months .....	20,051	15
	Equal per cutter .....	278	48
	"    " month .....	39	79
C.	82 cutters, net earnings for seven months .....	20,445	87
	Equal per cutter .....	249	34
	"    " month .....	35	62

The above earnings are net earnings after cost of powder, tools, fines, etc., are deducted.

The above are the average receipts by coal cutters for the seven months of 1887 worked after the strike of that year had ended, and when the reduced wages were paid.

Fines averaged 0.18 per centum and were imposed for stone sent out with coal.

The number of men employed will not agree with the previous statement, for, as far as possible, the men who worked but a part of the period were not included."

Acadia Coal Company's Collieries. From Workmen's standpoint:—

1. "Last year earned \$351.89 at box and pillar work. Married with family. Taxes from \$7.90 to \$9.80. Partly built own house out of money earned before going to mines. Saved no money since. Could not keep a family of seven on present wages. Pays 42 cents a month to doctor and voluntary fee to minister. Is paid monthly. Would be beneficial to be paid oftener, as men could live from \$5 to \$18 per month less for cash. Provincial Workmen's Association pays no benefits. Distress is met by men's subscriptions. Favors arbitration as a settlement of strikes. Coal sells higher than six or seven years ago and wages are lower."

2. "Thinks \$1 for every working day average earnings of fair coal-cutters; average man could get \$1.50, but does not think he has averaged \$300 the last three years. Company has no store.

Rent of company's houses varies from \$1.20 to \$2.50; three rooms and a porch for \$1.20. House he lives in (\$2.50) has five rooms and an upstairs; not fit to live in, and not very warm. Company supply coals at \$1.20 a ton, besides hauling. Has had one strike, or rather a lock-out, lasting from January to 15th May, reduction being the cause. Company accepted offer of compromise. Is paid once a month, on the 15th; two weeks held back. Not many accidents, except in 1880, when forty-four were killed, and six killed before them. There are fines for stony coals, damage to lamps and oil cans. If the guage is damaged it is \$3, cost only 80 cents; also fined \$5 more than price of lamp. Company gets fines. Men leave mostly on account of bad light, which is the cause of fines; men loading cannot see quality of coal. Has made complaint about light, but got no satisfactory answer. Sanitary matters are never looked after, and houses are neglected to a great extent."

3. "Cannot see properly with lamps. Would sooner be paid fortnightly or weekly. A coal cutter may make \$1.30 per day. Average earnings per month at the rate of \$1.30 to \$1.60 per day. Pays 42 cents per month to doctor; boy pays 30 cents. Doctor gives advice and some medicine, not all. Men choose doctor. Is paid monthly and pays taxes. School, \$1.00; road work, \$1.00; poll tax, 30 cents, some years 50c.; rent to company, \$2.50 per month; house cold and not well finished; no outhouse, except tenants erect them; no Board of Health. Weekly and fortnightly payments would encourage the men and lead to cash payments."

4. "Was discharged from Acadia Mines because he took part in labor organization. Had worked there for nineteen years. About thirty were discharged, some being taken on again. Thinks that men now belonging to labor organizations have the preference. Two dollars a day would be fair average in Acadia Mine. Is paid once a month; applied to be paid fortnightly or weekly, but did not get it. A majority desire it. If there are 28



lbs. of stone in the box 20 cents is checked off. Men have grumbled about fines being too heavy. No fund for sickness or disablement. Used to ask for donation of coal, fines for sickness, but always refused. Does not think men save any money; some with a large family of boys have accumulated something."

\* \* \* \* \*

\*The "Third Seam" pit of the Acadia Coal Company, partially lost in 1888, as stated above, was later connected with the "Deep" seam by stone drifts to the dip of the "Cage Pit"; and two upper benches of the "Deep" seam, divided by a band of inferior coal, were then worked simultaneously—the thinner or upper bench by the "longwall," the lower by the "bord and pillar" system.

The Acadia Coal Company also attempted to re-open the "Foord" Pit (A. D. 1889); but their new winnings "holed" into the old workings in the upper part of the main seam, in 1892, and the work was abandoned. Slopes from the "Deep" seam, however, reached the "Main" seam beyond the fire radius, in 1895.

These operations connected three seams, viz, the "Main," "Deep" and "Third", infested by fire; and, as the underlying gaseous "Fleming" and "McGregor" seams were connected with each other, and the "McBean mine" of the "Vale" Colliery, had been abandoned on fire in 1889, the Nova Scotia Government appointed a Commission to investigate the destructive fires in the Pictou coal field. The Commission collected much valuable and interesting information on the subject, all of which was published in the form of a Blue Book of the Legislature in A. D. 1896.

The "Cage Pit" has been re-entered and large shafts have been sunk on the "Main" and "Deep" seams, midway between Stellarton and New Glasgow.

\*Section of "Third" Seam as opened in the mine :—

Good coal.....	7 ft.	9 in.
Parting.....	3 "	9 "
Good coal.....	3 "	9 "
	11 "	6 "

## CHAPTER VIII.

The extinction of the General Mining Association's monopoly stimulated competing collieries in Pictou. In 1864 the Acadia Coal Co., Ltd., of New York, acquired a property in which the extension of the "Main" seam of the Albion Mines was discovered by Mr. Truman French, and commenced to operate two slopes on the right bank of the Coal Brook in the "McGregor" seam, which markedly improved in their western winnings†

The property included the "Fraser" and "Stellar" mines on the "Stellar" or Oil Coal Seam at Coal & McCulloch's Brooks.

\*The following is an analysis of this seam:—

	Coal Division.	Oil Coal Division.	Shale Division	Analyst.
Volatile Matter .....	33.58	66.56	30.65	
Fixed Carbon.....	62.09	25.23	10.88	How
Ash .....	4.33	8.21	58.47	

The product was valued for the oil contents of the "Oil Coal" bench; and prior to 1868 considerable quantities were exported to the United States for the distillation of oil and gas.

Sixty gallons of crude and thirty-five gallons of refined oil per ton are the reported practical yield of the mine.

The oil coal bench of this interesting seam is said to improve in size and quality to the east; and in Acadia Village, is said to have been proved 1' 10" thick, with a capacity of 120 gallons of crude oil per ton, i.e., about double its yield at the Fraser Mine.

The Acadia Company finally concentrated all its operations at two slopes in the "Main seam" which, in their property, proved to be;—

†A section of McGregor seam; Top Bench good coal, 6 ft. 10 in., 1 in. parting. Bottom Bench coal 7 ft. 4 in., parting 8 in.

\*Vide section page 128, 3rd column.

		Ft.	In.	
Main or Acadia Seam	Good Coal 1st Bench.....	2	9	} Fall Coal.
	Good Coal 2nd Bench .....	3	6	
	Fireclay .....	...	3	
	Good Coal 3rd Bench .....	3	8	
	Coarse Coal.....	...	1	
	Good Coal 4th Bench .....	3	3	
	Coarse Coal Fair .....	2	4	
	Coarse Coal not mined .....	2	4	
Total.....		18	2	

The colliery was connected with a loading pier 850' long x 20' in 26' of water L.T. at Fisher's Grant, by a short railway to Coal Mines Station.

The Nova Scotia Coal Company of New Haven, Connecticut, U.S.A., opened the Acadia seam in a neighboring property about 1868. The seam proved to be:—

	Ft.	In.	
Good Coal.....	7	2	
Fireclay Av.....	...	10	
Good Coal .....	2	9	
Stone .....	...	9	
Good Coal .....	2	3	} Middle Bench
Fireclay .....	...	$\frac{3}{4}$	
Coarse, good coal .....	1	..	
Fireclay .....	..	$\frac{1}{4}$	
Coarse, good coal .....	2	4	
Total.....		17	2

The Company's slope was connected by rail with a loading pier, on the Middle River, in 1871; and the Acadia Company was connected with and shipped at its Pier in 1879. These collieries, with the "Drummond" mine, to be referred to later, created the town of Westville and there organization has transformed a barren region, in which land values were as low as 25c. per acre into one of the most thriving industrial regions in Nova Scotia.



The "Vale Coal, Iron & Manufacturing Company" sunk two slopes in the McBean seam 7 ft. thick on the opposite side of the East River, seven miles from New Glasgow, in 1872. The Colliery which was connected with the Nova Scotia Railway System, and Pictou Landing, exploded in 1885, killing or injuring eighteen persons, and, after another fire in 1889, operations were restricted to the less regular overlying "Six Foot Seam," (3'—5' 10"—7' thick) which had been opened in 1883.\*

The Acadia," "Vale" and the "Old Mining Association properties" of the "Halifax Company" were amalgamated in 1885,† as stated elsewhere, under the name of the "Acadia Coal Company, Limited," and in 1891, the "Nova Scotia Coal Company's" property was added to the combination. The "Acadia Coal Company, Limited," thus represents the oldest mining operations in the Pictou field; the coal sales in that part of Nova Scotia from A.D., 1818 may therefore be summarized as follows:—

†ALBION MINES.		
Year.	Chaldrons & Bushels.	
1818	3030 00	
19	3081 00	
1820	2610 00	The identity of the "Vale" seams with any members of the Albion Mines or Westville Sections has not been made out
1	1370 00	
2	2004 00	
3	1400 00	
4	2261 00	
5	2081 00	
6	2901 00	
7	2573 00	Slack Coal.
8	2185 62	11 21
9	2644 37	26 25
1830	2951 00	40 34
1	3942 25	53 29
2	5735 03	142 16
3	9235 42	122 23
4	6762 33	165 49
5	8092 54	374 60

\*The McBean Seam is said to thicken to 14 ft. in one district.

†Inclusive of sales at the small pioneer works.

‡The property of the Halifax Co. was estimated, about A. D. 1878, to contain 67,365,000 tons of coal actually available for market.

## ALBION MINES.

Chaldrons & Bushels.		Slack Coal.						
Year.								
1836	15339 06	2131 11						
7	15370 27	1674 22						
8	14253 70	2040 27						
9	20540 43	1569 34						
1840	10547 45	1376 69						
1	20055 69	2009 03						
2	15025 59	2640 39						
3	10093 31	2224 00						
4	11677 69	2492 39						
5	20693 30	4028 39						
6	23663 69	3891 36						
7	35104 00	5874 60						
8	34194 24	5784 42						
9	27143 03	5180 33						
1850	28831 60	5448 54						
1	22233 36	4490 48						
2	28548 24	6325 12						
3	37410 60	7325 36						
4	35725 00	6253 06						
5	41383 24	4811 12						
6	39674 24	4962 48						
7	45913 00	7882 48						
	Albion Mines.	Acadia Co.	Vale Co.	Nova Scotia Co.				
	Tons	Tons	Tons	Tons				
8	114,952	.....	.....	.....				
9	138,760	.....	.....	.....				
1860	167,006	.....	.....	.....				
1	165,056	.....	.....	.....				
2	201,713	.....	.....	.....				
3	198,313	.....	.....	.....				
4	159,296	757	.....	.....				
5	203,334	6,964	.....	12				
6	194,301	10,530	.....	100				
7	120,385	10,912	10	41				
8	96,042	25,804	85	688				
9	86,530	52,567	427	294				
1870	79,240	73,683	172	650				
1	77,133	104,007	276	12,818				

Year.	Albion Mines Tons	Acadia Co. Tons	Vale Co. Tons	Nova Scotia Co. Tons
1872	98,865	123,063	.....	60,590
3	107,253	109,975	194	79,595
4	110,431	100,858	38,059	51,085
5	115,488	61,983	46,767	50,378
6	120,527	56,401	33,968	17,808
7	110,082	60,388	36,290	21,580
8	122,117	54,667	54,525	4,856
9	131,420	77,310	37,477	.....
1880	184,151	88,673	85,604	.....
1	51,645	81,346	86,870	.....
2	122,469	98,145	84,124	.....
3	148,785	106,614	68,843	.....
4	175,201	107,589	68,697	.....
5	114,061	90,428	93,634	.....
6*	60,496	92,532	121,779	.....
7	.....	194,195	.....	.....
8	.....	249,027	.....	23,686
9	.....	229,838	.....	32,390
1890	.....	242,697	.....	32,301
1	.....	249,113	.....	17,771*
2	.....	218,103	.....	.....
3	.....	182,324	.....	.....
4	.....	205,262	.....	.....
5	.....	173,962	.....	.....
6	.....	170,441	.....	.....
7	.....	179,882	.....	.....
8	.....	173,167	.....	.....
9	.....	224,655	.....	.....
1900	.....	258,378	.....	.....
1	.....	229,431	.....	.....
2	.....	245,278	.....	.....
3	.....	346,632	.....	.....
4	.....	271,223	.....	.....
5	.....	255,332	.....	.....
6	.....	260,971	.....	.....
7	.....	312,687	.....	.....
8	.....	330,757	.....	.....

1090 Persons employed

\*Amalgamated.



The "Bear Creek Area," south of the "Carmichael Area" of the Acadia Coal Co. and the "Sutherland Area," north of the "Mining Association," were acquired by the "Intercolonial Coal Mining Company," of Montreal; and about November, 1867, two slopes, called the "Drummond Colliery," equipped with two winding engines, were opened by the company in the Acadia or Main seam, viz:

	Ft.	In.	
Good Coal.....	5	9	"Fall Coal"
Fireclay.....		3	
Good coal, top bench .....	5	6	
Hard, grey coal .....		6	
Good coal, 2nd bench .....	4	6	
Coarse coal, not worked ...	2	1	
	<hr/>	<hr/>	
	*18	7	

The Colliery was connected with a shipping pier at Granton, on the Middle River, by 7 1-4 miles of railway. The road was equipped with three locomotives 60, six to seven ton coal waggons (20 of which were constructed at the colliery,) and miscellaneous platform and construction cars; and the pier, which curved into the river to about 22' of water was fitted with inclines to and from the outer end for the full and empty cars.

On May 13th, 1873, vast volumes of fire caused by a shot, issued from the face of a low level of the mine; and a tremendous explosion, which killed fifty-five persons hurled the debris of the colliery into the surrounding forest. A series of explosions then convulsed the works; and, for 36 hours lurid flames soared for 30 to 40 ft. above the numerous crop openings. Two days later the colliery was successfully sealed; pending its recovery, the "Deep" (Second) seam was opened by a shaft, and the "Main" seam beyond the fire radius by a slope; but, as the officials, who could complete the plans of the burning Main seam were entombed in it, the new slope "holed" into the lost workings and had to be temporarily flooded. The main colliery was ultimately recovered, and the "Deep" "(Second)" seam was more systematically

\*The Acadia seam deteriorates westerly from Westville to a split and unworkable seam at Middle River and to black shale at Brown's Brook still further westerly.

opened by the Scott Pit in 1882, and later by a 1000 ft. stone drift from the "Main" seam. Heavy volumes of gas invaded the latter as it entered the "Deep" Seam; and in December 7, 1892 it ignited after a shot; but it was re-opened after 10 days' submer-sion, after heavy volumes of firedamp, once fully 25,000 cubic feet, had rolled off the face.

According to the State papers of Canada, the relations between capital and labor at the "Drummond Colliery" about A.D. 1888, were:—

From the mine owner's standpoint:—

"Employ about 450 men and boys. Pay cutters 40 cents per cubic yard; hours 5 to 7 per day; average wages about \$2.00. Loaders earn from \$1.25 to \$1.60. Drivers paid 60c., 80c. and \$1.00; ages from 14 to 16. Lowest to trappers, 50 cents a day; the youngest is twelve years— from twelve to fourteen of that age. Parents bring them. Company rents houses to men. Cost of a double house, \$450. Rents, \$1.50; double house, \$2. Men in village pay a higher rent. A good many miners own houses; land costs from \$30 to \$40 an acre. Pay wages monthly, but there is a sub-pay once a fortnight for convenience of men. Clanny safety lamps used. If miner breaks glass or gauze he has to pay the cost. Had only one explosion in fifteen years. Carrying the men puts the company to great inconveniences, but is an accommodation to them. Very few labor troubles for years back, and always discussed point with men and arrived at decision. No difference made with a man who has acted as a delegate. Many men have cows, horses, waggons, and money in bank; one man had \$4,000 or \$5,000 in bank, saved out of earnings."

From Workmen's standpoint:—

"Gets up at 6 in the morning and home at 3.30; some cutters stay till 5 o'clock or until finished. Cutters try to make \$2 a day; (one cutter referred to as averaging \$1.25 per day for a month.) Manager has fixing of rates, and sometimes consults the men who are not always satisfied with the rate. When times are dull and

men plenty, the master absolutely fixes the price; when good and men not plenty, when they cannot command a fair price, they sometimes get it on strike. Helpers are paid by the men \$1.30 a day. Boys drive underground at twelve years of age. Those attending doors get 50 cents a day; when he begins to drive, 10 cents more. Have known them to get \$1 a day for running and caging, and when they get into loading, \$1.30 a day. Not long ago had a difference with employers with reference to reduction of wages; the men had to take what was offered, the manager not listening to proposal for arbitration. He would like to have a Government Board of Arbitrators—workingmen to have one representative. When gas has accumulated in mines it has been through carelessness on somebody's part; endeavor to get mines free from gas. With few exceptions, no open lamps are used. Quite a number own their own houses, and those having to pay rent think they pay more than is fair. Some pay \$2.50 a month—some with four rooms, some with two; about the same rent to company as outsiders. Coal half price to miners and cutters, 60 cents a load of 12 bushels, exclusive of hauling, which is according to distance; thinks \$1.20 a ton. Cost of house of \$2.50 a month is worth \$200 to build, and is on blocks on a level with ground or a little above. No outhouses or drain, unless dug by tenant. Does not know of any docking for dirt and short weight. Is paid twice a month. Not many complaints as to mode of payments. No sick fund and no assistance in case of sickness or death. Men would like to have one. Company supplies powder, but can buy anywhere they like. Doctor's fee optional; thinks it is 42 cents. Considers that workingmen should have first lien on mine for wages before mortgage; roughly estimated, in Nova Scotia men have lost \$100,000 for lack of a law to give him his wages. Men have no claim. Would like an Employers' Liability Act, as in England, in case of accidents through no fault of men. No damages allowed for Drummond colliery accidents. About 300 men and boys are employed in the mine"about 80 or 90 boys."



The "Main" seam air shaft was sunk to the "Deep" and \*"Third seams in 1898; and in 1904 the two lower seams were further connected by a stone drift, which has been extended into the bed of fireclay under the "Third" seam. The clay proved satisfactory for the manufacture of fire bricks not required for blast furnace use, and a brick making plant has been erected at the mine.

#### COAL SALES OF INTERCOLONIAL COAL MINING COMPANY.

Year.	Sales— Tons.	Labor employed, men and boys.	Av. quantity raised per day—Tons
1865	40	.....	.....
6	603	....	....
7	443	.....	.....
8	914	....	.....
9	58,271	.....	.....
1870	72,603	.....	.....
1	51,487	....	....
2	105,545	....	....
3	36,524	....	.....
4	56,214	....	....
5	62,252	....	....
6	46,914	....	....
7	55,815	.....	.....
8	52,238	....	....
9	84,670	.....	.....
1880	76,489	....	.....
1	127,107	....	.....
2	141,399	....	.....
3	137,567	....	.....
4	112,694	....	.....
5	97,887	336	532
6	93,609	325	448
7	142,963	359	543
8	145,395	....	.....
9	119,873	....	....
1890	154,556	....	....
1	136,087	....	.....
2	185,929	.....	.....
3	156,839	....	....

\*Deep seam was 12 ft. 3 in. and the Third seam 8 ft. 6 in. thick at that point.

Year.	Sales— Tons.	Labor employed, men and boys.	Av. quantity raised per day—Tons
1894	206,777	....	....
5	194,822	.....	.....
6	181,252	....	.....
7	160,352	.....	....
8	208,248	.....	....
9	185,193	....	....
1900	226,535	....	....
1	191,482	....	.....
2	189,183	.....	....
3	226,221	....	....
4	243,140	....	....
5	197,897	....	.....
6	277,383	842	....
7	274,524	895	1196
8	263,817	937	1173

The Marsh Colliery was opened by a slope in the McKay seam, four miles east of New Glasgow by the Nova Scotia Steel & Coal Company of New Glasgow in 1901, and the mine was connected with the Steel Works over the Vale Colliery and Inter-colonial Railways. The winnings were closed in 1909, up to which year about 313,000 tons of coal had been produced.

The Pictou coal industry, formerly hampered by costly explosions, and by the developement of the Cape Breton Collieries now promises to expand on a scale more commensurate with its early importance; and the old collieries of the field, when compared with those recently opened near the East River, afford a striking illustration of the progress of coal mining in Canada.

The evolution in the mechanical appliances of the Pictou Coalfield during the past eighty years, is described by H. S. Poole, F.R.S.C., ex-Inspector of Mines for Nova Scotia, as follows: "Mechanical Appliances Past and Present.

*Then*—Ropes for winding coal were flat, of hemp or iron wire.

*Now*—They are round, of steel and of high tensile strength.

*Then*—The winding in shafts was slow, the skips swinging free against spilling boards.

*Now*—There is rapid winding in cages with guides and perhaps springs and safety catches to ease the shock and prevent overwinding.

*Then*—Shafts were numerous, close together in the direction of the dip.

*Now*—New pits and the haulage is concentrated from long distances to central points:

*Then*—Ventilation was by fire lamps and furnaces.

*Now*—By mechanical fans of high speed and water gauge.

*Then*—Open lights were general and the "sulphur" man used the single gauge Davy safety lamp:

*Now*—Safety lamps are generally used, and are of double gauge with glass rings:

*Then*—Boilers of low pressure, hay stack in form:

*Now*—Of high pressure, flue or water tube.

*Then*—Engines vertical with a beam of slow speed:

*Now*—Of high pressure and rapid, sometimes compound with cut off.

*Then*—Coal was carefully built by the miners on skips made with bales and loose iron rings. The skip separate from the rolley that carried it from the gate road end to the shaft was dragged on its runners from the working face to the rolley way. The rolley had edge wheels wedged fast on square iron axles.

*Now*—Pit boxes, hutches or mine cars with chilled flanged wheels shrunk on round steel axles bring the coal from the face.

*Then*—On banking, the skips were tipped by main strength, the iron rings tumbling with the coal on the screens to be gathered and carried up again to the pit head:

*Now*—Cages automatically discharge cars to automatic tipplers



which discharge over moving screens and picking belts, all engine driven.

*Then*—Coal cutting was an art, the collier took pride in his ability to handle the pick, to cut a straight and narrow shearing, to make a low holeing deep.

*Now*—A neat wall is only seen in old workings; rough, ragged and irregular sides are accepted with the urgent demand for large outputs."

Mining methods in Pictou have varied with the altering conditions in the inclination and thickness of the coal and the strength of the roof and pavement. "Where," says H. S. Poole, "the roof was strong near the crop, the openings were large, the standard width of six yards being often exceeded; and the pillars of coal left to support the roof were small, (but a few feet in some places) and yet they held up for years. Necessarily with a dip of  $18^{\circ}$  or over, the rooms or bords were driven parallel with the strike and were connected in sets by diagonal horse slants. As laid off the proportion of pillar to opening stood well enough even to a depth of 500 feet, until the balance was lost at a weakened spot and then there was a crush. The workings initiated in 1839 toppled over and became the crushed mines of 1852. At equal depth, thicker pillars also yielded to an increase weight brought on by subsequent pillar robbing in the Dalhousie workings; while at much greater depths no proportion would maintain the openings, and now at depths of 1,200 and over, operations are so conducted as to bring on an immediate settlement; levels which would not remain open for three months timbered at nine feet wide are now driven twenty feet and packed on both sides of the hauling roads. The present system for the inclined seams being to drive levels in pairs every 400 or 600 feet apart, with balances to the full rise every 380 feet, and to have the panel of coal so blocked out, removed longwall advancing. Every set of four men have a road between close packs for a face of twelve yards."

The phenomena of the Pictou mines includes irregular pressure from irregular working of the overlying seams, squeezings of fireclay bands out of the seams by the vertical pressure of the strata, shrinkages of openings 30 per cent. in a few months by lateral pressure on the walls of the inclined seams, close timbering, until for long distances, only blocks of wood are visible, except at the working faces, saggings and breakings of the roof over the booms, coal winning by utilizing the pressure of the strata, and the extracting of pillars amid conditions excessively alarming to the inexperienced.

The following "Blasting Rules" are now in force in the Pictou coalfield at The Acadia Coal Co's. Mines:

1. When a miner holding a shot-putter's certificate is given permission to fire his own shots, before firing he must carefully examine the place where the shot is to be fired, and if he discovers any noxious gases, defects in the roof, or danger from other source, no shots are to be fired until such danger is removed.
2. No shot must be fired until the face is either sheared, mined or undercut, not less than three feet deep, the full size of the place, or having an open end equal to the same, without special permission.
3. No shot must be fired when the borehole used for firing extends beyond such mining, shearing, undercutting or open end. All holes found beyond such mining, shearing or open end will be termed fast shots.
4. No shot must be fired with the timbering at a greater distance from the working-face than eight feet, or closer if required by the management, or by a special permit that timbering may be a greater distance from the working-face.
5. He must return immediately to each shot after it fires, and if he should find that the shot has lighted a blower of gas, liberated a quantity of gas or disturbed the roof or timber, and caused danger beyond his control to either extinguish, repair or

make safe, he shall immediately notify some official at the time in charge of the mine or district in which he is working.

6. When a "bench" shot has been fired, the miner must immediately proceed to turn over the coal or load it out.

7. If the shot fails to go off, no person shall be permitted to enter to the working-face until such time as he receives permission from and is accompanied by the examiner of that section.

8. No holes shall be charged for a longer period than thirty minutes before being fired.

9. If, owing to an insufficient charge of powder, a face shall be "hung-up," all the coal to the depth of that shot must be mined out by hand-pick or machine, unless permission is given by the examiner of that section to drill and fire another shot.

10. No miner or shot-firer shall leave any charged hole in his working-face, when quitting for the day.

11. No person shall drill any hole in such manner that when fired it will be liable to shoot into either roof or bottom of the coal-seam.

12. If a miner, at any time before or after firing a shot, finds that any timber requires to be set or replaced, he must not leave the place until such requirements are duly executed.

13. He shall also set sufficient holeing-props when required to do so, and to work his place in a safe and proper manner.

14. In firing shots with a battery, the wires shall be first connected to the fuse-wire, and the connection to the battery shall be made only by the person who has made the connection to the fuse-wire.

15. Every precaution must be taken to ensure each person being in a safe place before any shot shall be connected up to a battery.

16. No battery shall be tested or tried at any point outside of the lamp station.

17. Batteries shall only be used by those holding shot firers papers.

18. No person shall fire shots without permission from the examiner or official in charge of the mine.

19. All holes must be stemmed with clay. Mines Regulation Act, provides that only copper tipped or wooden stemming bars or needles can be used.



†The following boreholes have been sunk in Pictou County :—  
401 feet, by a Calyx Steam drill, A. D. 1903-4, in sandstone assigned to the Permian series, about  $1\frac{1}{2}$  miles north of New Glasgow, and  $\frac{1}{2}$  mile west of the East River. The hole was continued in the "New Glasgow Conglomerate;" but it was abandoned at 565 ft., owing to the loss of the core barrel and bit. A second hole sunk 2000 ft. with a churn drill has been also abandoned in the Conglomerate also one at Rear Brook at 3100 ft.\*

The following hole was bored with a Diamond Steam drill, about a quarter of a mile east of the Fox Brook Road, some two miles from the "Drummond Colliery, A.D., 1902-3:—  
Surface, Sandstone, Shale and Fireclay, total depth, 620 ft. 0 in.

The section of a hole bored at the "Drummond Colliery," (No. 4 mine) A. D., 1907, between No. 1 and No. 2 slopes was:—

	Ft.	In.
Coal .....	1	6
Shale.....	7	2
Ironstone .....	5	..
Shale, Fireclay, Ironstone, Sandstone.	225	8
Coal .....	14	5
Shale, black.....	5	3
Total depth of hole.....		259 ..

Four holes were bored in the New Glasgow district during 1908, viz.:—

No. 1. North branch of Pottle's Brook, 600' North of Chisholm's Pond; 1-4 of a mile east of the East River Road.

	Ft.	In.
Surface and Sandstone .....	15	10
Coal .....	...	7
Shale and Sandstone .....	152	1
Shale, black .....	18	9
Coal .....	4	...
Shale and sandstone to bottom .....		

Total depth of hole..... 909 ..

†The Author omitted to mention, at page 128, that when the "basin" was reached in the "Six Foot" seam at the Vale mine its axis was found to dip towards the N. E. and widened in that direction, being 6 chains 50 links wide, 24 chains eastward of the slope bottom, the coal lying irregularly and in rolls. N. W. of the axis the dip was 10°.

\*These boreholes were sunk to cut the assumed direct northern extension of the Pictou coalfield under the newer strata. This extension is doubtful, the coalfield being evidently restricted near the Permian by the extension of the Cobequid axis, i. e. the high land Frasers Mountain to Mount Dalhousie. The coal measures under the Pictou Permian, if present, are probably more directly connected with those north of the Cobequids, than with the Pictou coalfield series.

No. 2. Lourdes, on the west side of the East River, 150 feet from the river, and 1000 feet north of the I.C.R. Bridge:—(842')

Dip of strata S. E.  $26^{\circ}$  to vertical.

Surface; black & gray shale, ironstone & clay ironstone bands.

No. 3. Lourdes, near the S.W. corner of Lourdes' Cemetery:

	Thickness Bored.	
	Ft.	In.
Surface and shale .....	51	..
Black, carbonaceous shale .....	27	...
Grey shale with sandstone .....	35	9
Green shale with ironstone bands .....	50	..
Shale, sandstone and ironstone bands .....	266	...
Coal .....	34	3
Black grey and brown shale .....	157	9
Coal .....	22	5
Dark brown shale .....	1	10
<hr/>		
Total depth of hole .....	646	...

Dip of strata N. E.  $15-42^{\circ}$ .

No. 4. Albion Mines, 600' S.  $60^{\circ}$  W of the McGregor Pit Engine House:—Drilled on an angle of  $68^{\circ}$  dip of strata N. E.  $22^{\circ}$ .

	Thickness Bored.	
	Ft.	In.
Surface, fireclay, shale, sandstone .....	134	..
Coarse or shaley coal .....	2	9
Carbonaceous and non-carbonaceous shale, sandstone and fireclay .....	180	6
Black shale (with fossil fern remains) ....	6	2
Grey shale .....	9	3
Coarse, shaley coal .....	3	4
Shale, black, carbonaceous .....	3	6
Coal, mixed with carbonaceous shale .....	9	...
Black shale, slightly carbonaceous, sandstone, fireclay, with and without nodules or bands of clay ironstone	151	6
<hr/>		
Total depth of hole .....	500	...

Owing to the variability in the seams the tonnage of Pictou coal available for market is not readily ascertainable; but there is good reason to believe that the field will yield a minimum of fully 150,000,000 tons of 2240 lbs. up to the present standard of the Pictou coals.

## CHAPTER IX.

The Permian to the north of the Pictou coalfield extends \*westward for about 100 miles to Chignecto Bay, interrupted, east of Springhill, by an anticlinal elevation of underlying carboniferous strata, which divides it into two distinct basins. From this axis the eastern Permian basin dips towards Pictou, exposing coal in its carboniferous rim at Oxford Junction, Thompson Station, †Polly's Brook and Big Lake; the western dips towards Chignecto Bay, exposing the coal measures of the Cumberland coal field in its carboniferous rim at Springhill, at other points in northern Cumberland, and at the Joggins.

The known area of the Cumberland Coalfield lies between the Bay of Fundy and the Gulf of St. Lawrence, and extends, it is believed, over a larger area under the Permian. The field has tide-water outlets in Minas Basin and Chignecto Bay, extensive inland communications over the Intercolonial Railway, and lies nearer New England than any other Nova Scotia coalfield.

The following descending section of the coal measures thrust up from beneath the Permian at Springhill, and dipping N. W. ‡ 30—38°, has been compiled at Springhill Colliery from a horizontal tunnel 502 feet long, between No. 3 and No. 1 seams, another 250 feet long between No. 1 and No. 2, and from a tunnel cut across the strata underlying No. 2 seam for 1,122 feet, from the 2,600 ft. level of No. 2.

\*North of the Cobequid axis.

†The small coal seams at Polly's Brook and Oxford Junction can be correlated with similar seams in the lower part of the Springhill section.

The axis of the eastern basin, which may be observed in the Valley of Polly's Brook, enters Northumberland Straits 3 miles east of Cape John.

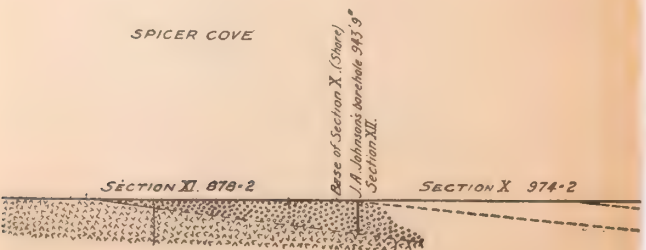
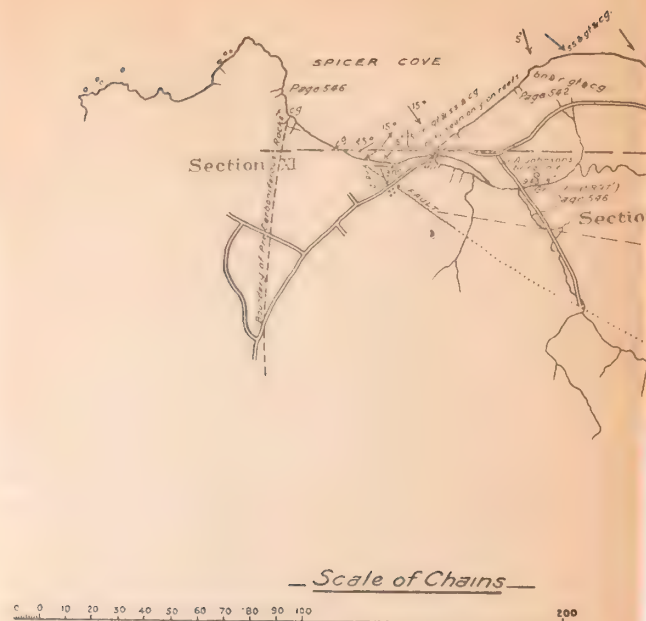
‡At west slope, opened A. D. 1872 (actually N. 60° W. True Meridian; variation 21° 45' W., A. D. 1872-3).



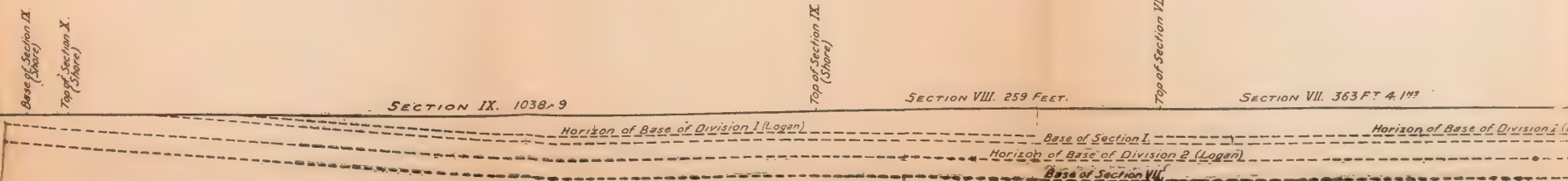
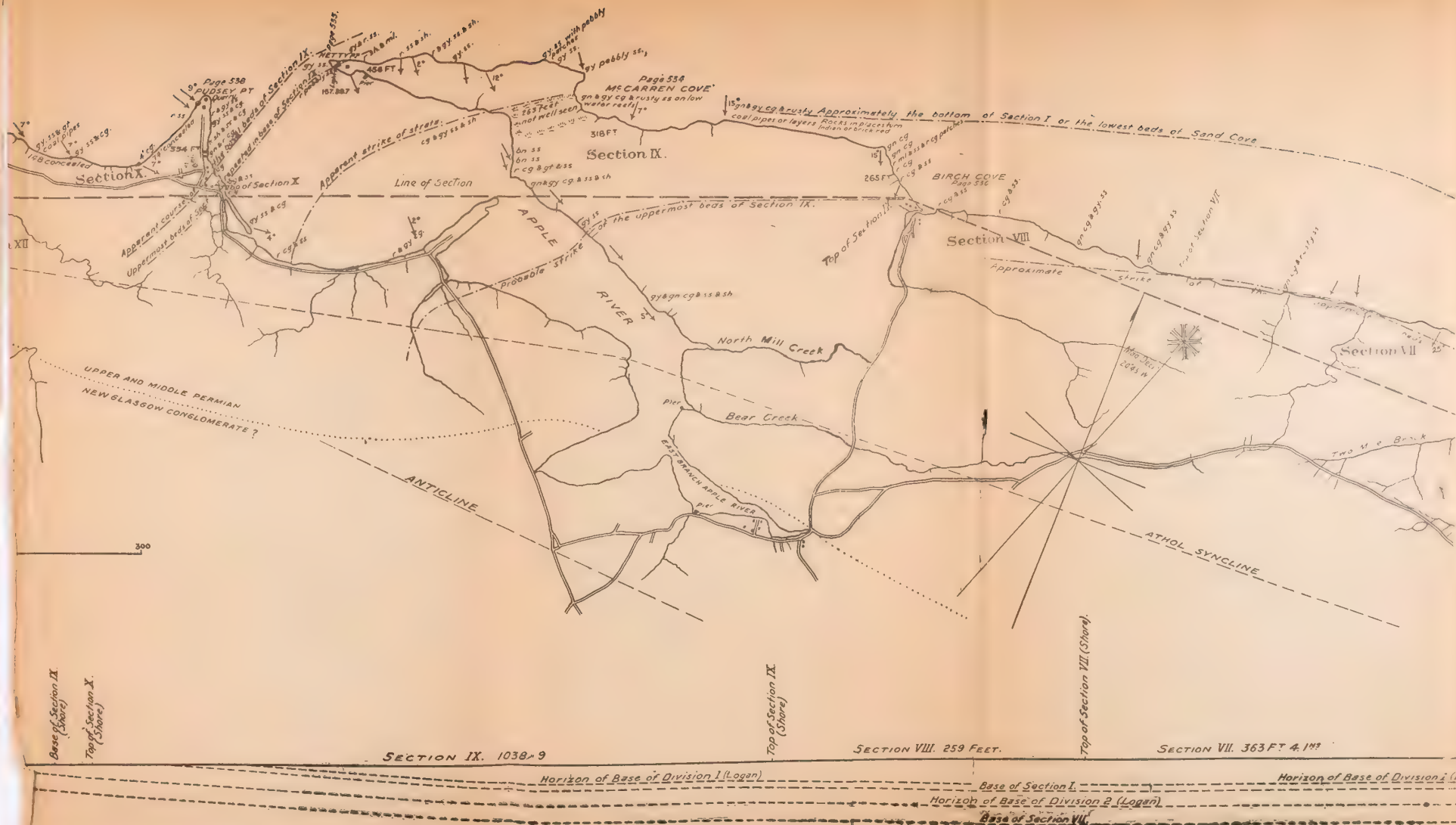
		Ft.	In.
1	Coal, north or No. 3 seam .....	9	0
2	Strata .....	238	0
3	Coal, East or No. 1 seam .....	10	0
4	Strata .....	118	0
5	Coal, West or No. 2 seam.....	10	0
6	Strata .....	45	5
7	<div> <div> <div>Coal 0 ft. 1 in.</div> <div>Stone 0 ft. 8 in.</div> <div>Coal 2 ft. 0 in.</div> <div>Stone 0 ft. 2 in.</div> <div>Coal 0 ft. 3 in.</div> </div> </div>	3	2
8	Strata .....	44	6
9	<div> <div>Coal 0 ft. 9 in.</div> <div>Stone 0 ft. 3 in.</div> <div>Coal 1 ft. 10 in.</div> </div>	2	10
10	Strata .....	5	4
11	Coal.....	0	11
12	Strata .....	85	10
13	Coal .....	2	2
14	Strata .....	29	2
15	Coaly shale.....	0	2
16	Strata .....	37	7
17	Coaly shale.....	0	2
18	Strata .....	7	8
19	Coal.....	2	1
20	Strata .....	27	11
21	Coal.....	1	7
22	Strata .....	39	4
23	Coaly shale and coal.....	0	6
24	Strata .....	25	5
25	Coal.....	0	6
26	Strata .....	42	4
27	<div> <div>Coal 0 ft. 11 in.</div> <div>Stone 0 ft. 3 in.</div> <div>Coal 1 ft. 5 in.</div> </div>	2	7
28	Strata .....	10	7

		Ft.	In.
29	$\left\{ \begin{array}{l} \text{Coal} \quad 0 \text{ ft. } 3 \text{ in.} \\ \text{Stone} \quad 0 \text{ ft. } 7 \text{ in.} \\ \text{Coal} \quad 2 \text{ ft. } 0 \text{ in.} \end{array} \right\}$ .....	2	10
30	Strata .....	11	4
31	Coal .....	0	4
32	Strata .....	3	10
33	Coal.....	0	3
34	Strata .....	20	1
35	Coal.....	1	0
36	Strata .....	11	2
37	Coal and coaly shale and stone .....	1	1
38	Strata .....	8	10
39	Coal.....	0	4
40	Strata .....	28	5
41	$\left\{ \begin{array}{l} \text{Coal} \quad 0 \text{ ft. } 3 \text{ in.} \\ \text{Stone} \quad 0 \text{ ft. } 2 \text{ in.} \\ \text{Coal} \quad 0 \text{ ft. } 6 \text{ in.} \end{array} \right\}$ .....	0	11
42	Strata .....	25	0
43	$\left\{ \begin{array}{l} \text{Coal} \quad 0 \text{ ft. } 0 \frac{1}{2} \text{ in.} \\ \text{Stone} \quad 1 \text{ ft. } 7 \text{ in.} \\ \text{Coal} \quad 0 \text{ ft. } 1 \text{ in.} \\ \text{Coaly shale } 0 \text{ ft. } 5 \text{ in.} \end{array} \right\}$ .....	2	1 $\frac{1}{2}$
44	Strata .....	35	0
45	$\left\{ \begin{array}{l} \text{Coaly shale } 0 \text{ ft. } 2 \text{ in.} \\ \text{Coal} \quad 0 \text{ ft. } 2 \text{ in.} \\ \text{Coaly shale } 0 \text{ ft. } 2 \text{ in.} \\ \text{Coal} \quad 2 \text{ ft. } 6 \text{ in.} \end{array} \right\}$ .....	3	0
46	Strata to face of tunnel.....	5	8
Total thickness .....		963	11 $\frac{1}{2}$

The workings of the colliery extend under gray and red sandstone and shales, classified as Permian by the Canadian Geo. Survey.



Plan and Section From Spicer Cove to Seaman Brook, Cumberland

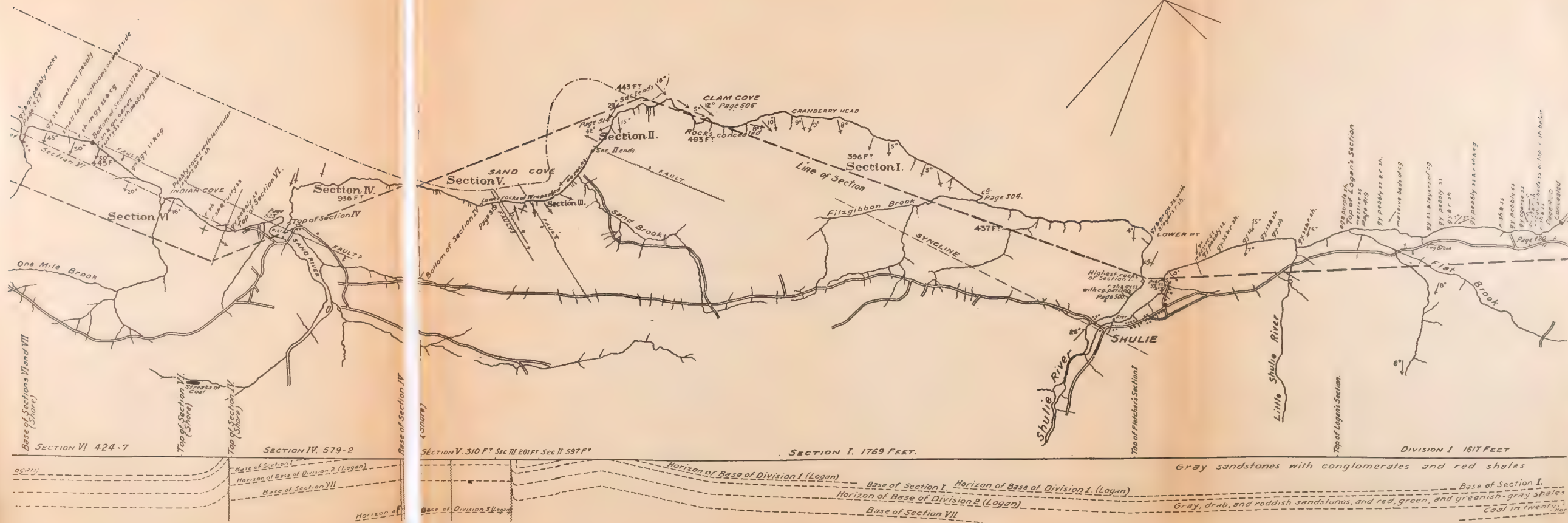


Nova Scotia, including the celebrated Joggins Section of the Nova Scotian Coal Measures, Illustrating Measurements by Sir William Logan and Hugh Fletcher on Carboniferous Rocks of Cumberland County, referred to on page 167.  
(Spicer Cove to Two Mile Brook.) Reproduced by permission of The Nova Scotia Institute of Science.

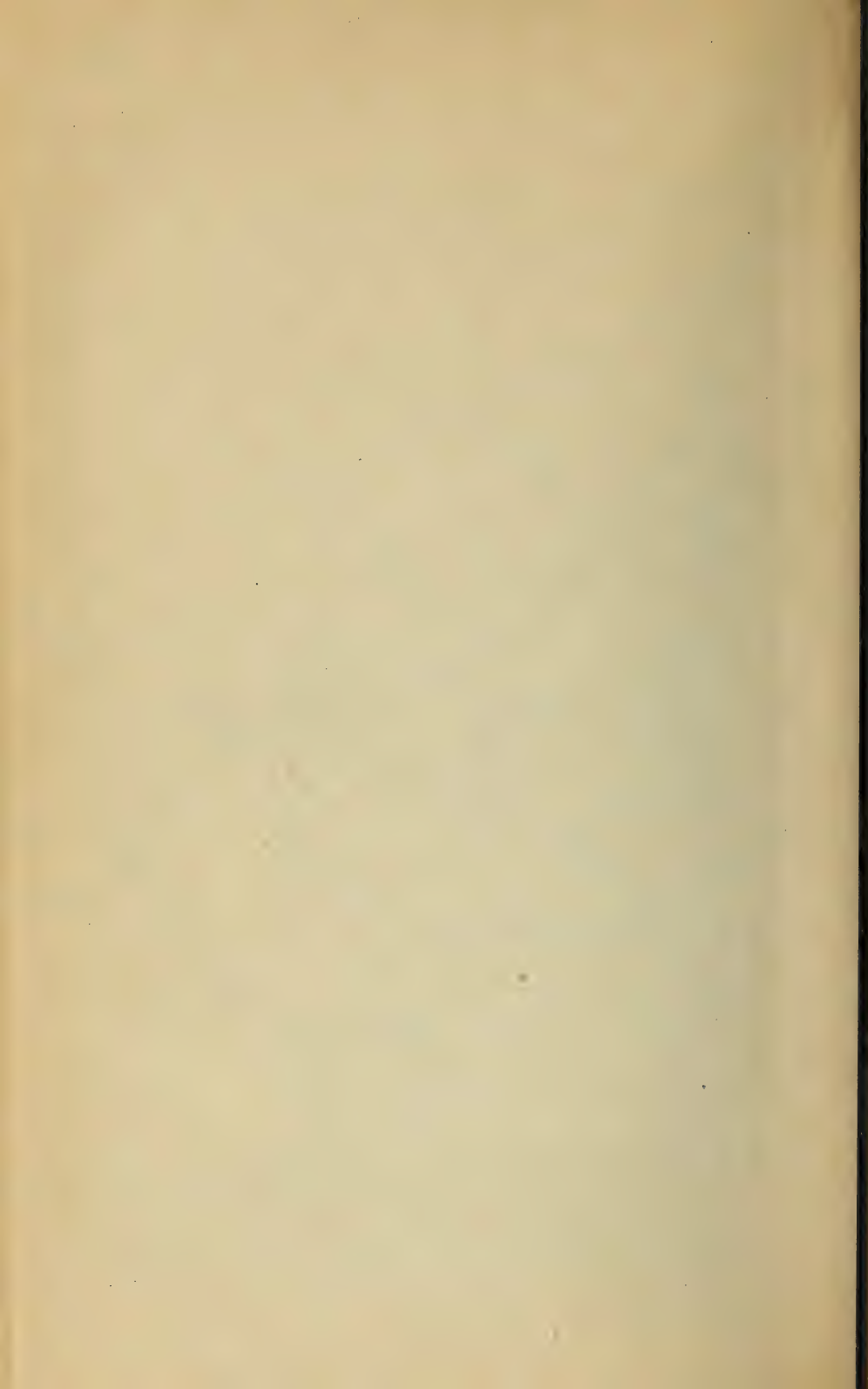




Scale of Chains.

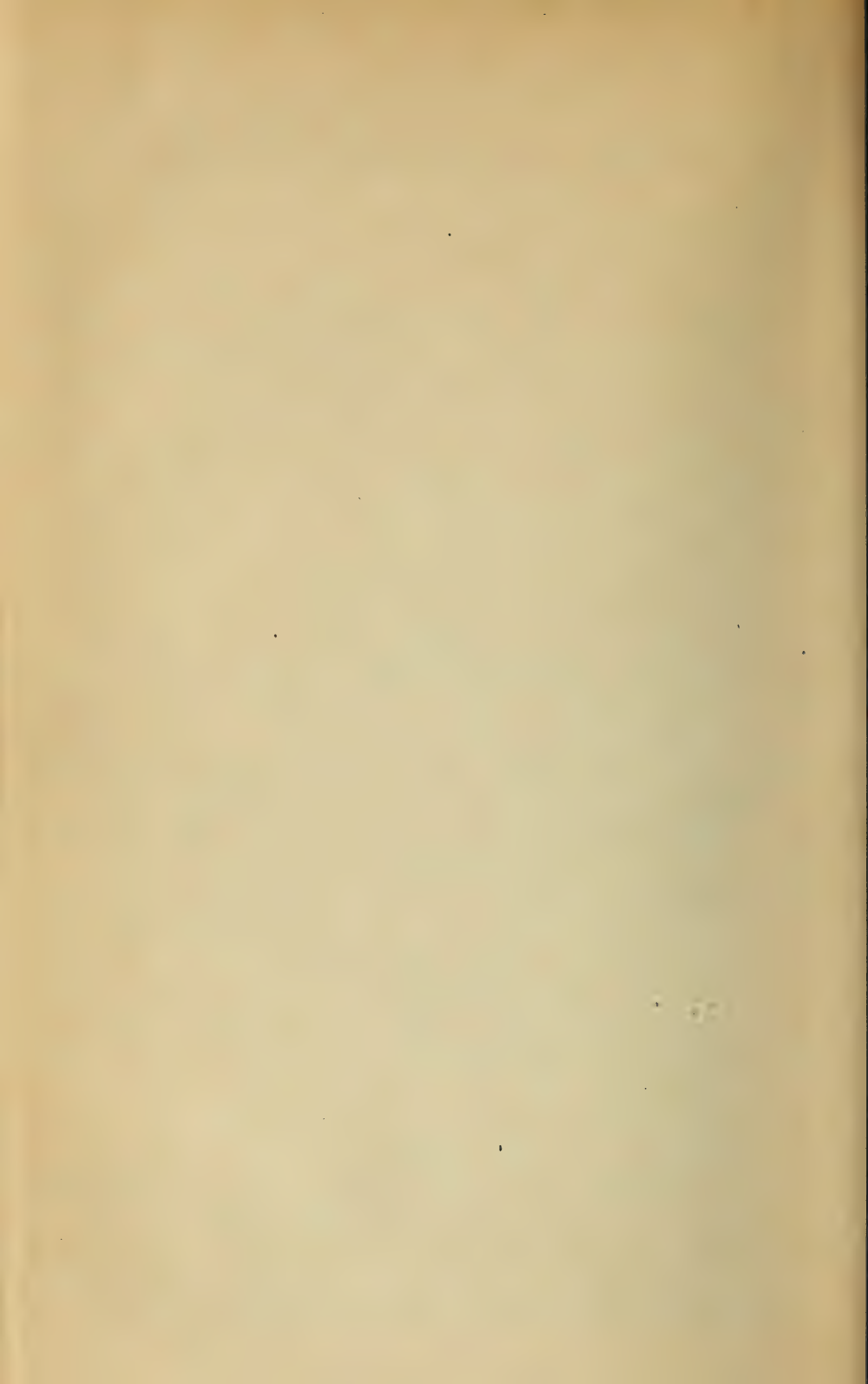


Plan and Section, Spicer Cove to Seaman Brook, including the celebrated Joggins Section of The Nova Scotian Coal Measures, continued (Two Mile Brook to Leary Raft Brook).









Coal measures, dipping, usually at an angle seldom exceeding  $30^{\circ}$  westward, have been traced southward from Springhill, almost to the Cobequid Hills; thence coal measures have been traced  $2\frac{1}{2}$  miles westward of Upper Maccan River, and the underlying millstone grit series for nearly 2 miles further; but boreholes in †the Permian, in search of their further extension west, have failed to reach them at 2518 feet at Pettigrew Settlement near Fullerton or Halfway River Lake; at 2484 feet (almost exclusively in conglomerate) near Newville Railway Station; and at 944 feet at Spicer's Cove, Chignecto Bay.\*

The section of the last hole was as follows:—

Surface material, gravel, &c., sandstone, argillaceous shale with fossils, shales, sandstone, conglomerate,		
8 inches black coaly shale, 4 ft. 2 in. shale,	Ft.	In.
showing graphite .....	82	0
Reddish conglomerate (with thin sandstone and shale bands)...	811	6
Felsite and quartz felsite .....	50	3
Total. ....	943	9

From Spicer's Cove, the Permian followed by the underlying Carboniferous series extend along the cliffs of Chignecto Bay (vide detailed measurements by Hugh Fletcher, B. A. and Sir William Logan, "Transac Nova Scotia Institute of Science" Vol. XI) until the productive coal measures of the Cumberland Field reappear, dipping S.  $25^{\circ}$  W.  $19^{\circ}$  Mag, and strike S.  $65^{\circ}$  E. Mag, A. D. 1855, near the Joggins Mine, as follows:—

†Also in its basal (New Glasgow) conglomerate about  $5\frac{1}{2}$  and 7 miles beyond the last exposure of the grit rim of the Basin.

‡A core obtained from the Newville borehole at about 1300 feet showed a reddish gray coarse conglomerate, composed of pebbles of quartzite, felsite, slate and other Pre Cambrian rocks, the dip of which did not seem to exceed  $7^{\circ}$ . At 2186 feet the drillings indicated a similar conglomerate. For the great depth at which the "New Glasgow" conglomerate lies near the East River in Pictou County, vide page 162. Where the drill has passed out of the conglomerate, at Spicer's Cove, Cumberland Co., the underlying rock is classified as Devonian by the Canadian Geo. Survey.

\*The Basal Permian ("New Glasgow") conglomerate is exposed on the shore of this coastal indentation.

For detailed section of Spicer's Cove borehole, Vide Transac, N. S. Inst. of Science, Vol. XI

The structure of the Cumberland field is probably complicated westward of Springhill by transverse northerly and southerly folds or faulting from the Cobequids to the Joggins-Styles district.



(Descending Order).

	Ft.	In.
Grey and black shale .....	1	4
Coal .....	...	8
Underclay, sandstone, shale and underclay .....	17	9
Coal .....	...	1
Sandstone and shale .....	30	6
*Coal } Main or "King's" seam .....	{ 3	6
Shale } .....	{ 1	6
Coal } .....	{ 1	6
Underclay, sandstone and shale .....	40	..
Coal .....	...	1/2
Grey shale .....	...	11 1/2
Coal and shale .....	...	1/2
Sandstone and shale with ironstone bands .....	17	9
Coal .....	...	1
Sandstone and shale .....	16	4
Coal .....	...	3
Underclay .....	...	5
Coal "Queen's" seam .....	1	9
Shale .....	4	4
Coal .....	1	...
Underclay, sandstone and shale .....	122	...
Coal .....	...	8
Underclay .....	...	2
Coal .....	...	2
Sandstone and shale .....	152	..
Coal .....	...	2
Sandstone and shale .....	35	6
Coal and shale .....	1	...
Sand stone and shale .....	140	8
Coal .....	...	8
Underclay, shale and sandstone .....	58	...
Coal and shale .....	1	2
Sandstone and shale .....	17	10

\*This bench contained 3 inches shale where opened in the original mine by the General Mining Association.

	Ft.	In.
Coal .....	...	6
Sandstone and shale ....	23	...
Coal.....	..	4
Underclay, Sandstone and shale.....	185	...
Coal.....	...	1
Underclay, sandstone and shale....	21	...
Bituminous limestone.....	3	...
Coal with clay partings .....	2	9
Underclay, sandstone, clay and shale.....	30	6
Coal.....	...	10
Underclay, sandstone and shale.....	39	...
Coal .....	..	5
Bituminous limestone.....	...	4
Coal.....	..	7
Underclay, sandstone and shale.....	134	6
Coal and shale.....	5	0
Underclay and shale.....	6	3
Coal.....	...	5
Shale.....	4	...
Coal and shale.....	...	4
Shale.....	...	9
Coal.....	...	2
Shale .....	...	10
Ironstone and Bituminous limestone.....	...	3
Underclay and shale.....	4	...
Coal, "Hardscrabble" seam .....	4	...
Underclay.....	1	6

The Lower Carboniferous, Millstone Grit, Coal Measures, etc., ascend (geologically) S. W. from Mill Creek, Minudie, to a synclinal axis near the shore at Shoulie; thence Permo Carboniferous or \*Permian undulate without serious faulting S. W. toward Spicers Cove, terminating upon a heavy bed of conglomerate resting on the Cobequid Hills. From the Joggins the northern fedge of the productive coal measures, about 2 miles broad, faulted and variable in their composition, particularly in the size of the coal seams, as elsewhere in the Cumberland Field, extends for more than 20 miles inland, dipping towards the south at an angle increasing eastward to at least  $45^{\circ}$ . Their connection with Springhill is not clear, Lower Carboniferous and Millstone Grit appear-

\*The difference between the lowest beds of the Carboniferous and those classified as Permo Carboniferous is well seen on Minudie Point, Cumberland Basin, Chignecto Bay.

†The breadth stated here is the approx maximum.

ing (vide Map Geo. Survey, Canada: Part A. Report, Vol. 15) by faulting in that direction; but they undoubtedly form the northern edge of the Springhill series. The small collieries, in this narrow belt are described in the Annual Mines Report, which (1881 and 1891) contain 5 seam sections opened at the Styles about 17 miles from the Joggins, and further east. Sections of these productive measures further west also appear in the "Nova Scotian" Mining Edition, Halifax, 1903. The progress of the Cumberland field, though slightly checked by one disastrous explosion (1891)\* has not been retarded like the Pictou Field by mine fires, owing in part, it is suggested (Mines Report, 1891) to the absence of the impermeable Bituminous shale cover, which forms so extraordinary a feature of the Pictou coal measures.†

\*                      \*                      \*

The application of Dr. Abraham Gesner for a lease of the Joggins coal, if the General Mining Association neglected to work it after notice from the Crown to do so, and the public agitation against the exclusive monopoly of the Nova Scotian coal trade, by the Mining Association, stirred up by Gesner, forced the Mining Association to open the Joggins colliery in the Cumberland coal-field, A.D., 1846, in order to preserve their monopoly. Although coal had long been privately mined at the Joggins, and, to the extent of some 1500 bushels per annum, at Springhill, for the local and St. John, N.B. markets, no regular mines at that time existed in Cumberland. After ascertaining the course of the seams between Springhill and the Joggins, the Association sunk a shaft and drove a water level from the shore in the Kings or Joggins Main seam.

The mine, was equipped with a double horse hoisting gin, and connected by an incline railway with a small loading pier about 800 yards distant. The coal above water level was wrought during the shipping season for the local and St. John, N. B. markets; but owing to the competition of English coal imported into St. John at ballast rates of freight, the output increased very slowly.

\*February 21st, 1 p. m., 125 men and boys lost.

†Black Bituminous shales overlying the Main Seam of Pictou to a depth of 1000 ft. near the East River. Vide also last table p. 162, also 1st p. 163.



The coal held in connection with the mine was restricted to four square mines, at the abolition of the company's monopoly, A. D. 1857. In 1871 the property was sold to T. W. Daniel, Alex. Barnhill and Alex. Jardine, who transferred it to "The Joggins Coal Mining Company" on October 24, 1871. On January 29, 1872 that company sold half of the property, including the colliery itself to the "Joggins Coal Mining Association, reserving the remaining two square miles, in which an adit had been opened in the "Hardscrabble" seam about 1866; but they abandoned this\* mine in 1877, after the sale of 4011 tons of coal. The Joggins colliery was hampered by the competition of imported and rail borne Springhill coal at St. John; but its sales improved, after it was connected with the Intercolonial Railway at Maccan in 1887; and they further improved after, "The Canada Coal & Railway Co., Ltd.," acquired the property in 1892.†

The sales to date have been :—

Year	Chaldrons	Bushels	Tons
1848	446	64	.....
9	921	45½	.....
1850	1215	54½	.....
1	1321	73	.....
2	1796	120	.....
3	1996	51	.....
4	3017	33	.....
5	2029	75	.....
6	2888	117	.....
7	2586	104	.....
8	....	.....	3603
9	....	.....	3520
1860	....	.....	8320
1	....	.....	5296
2	.....	.....	3347
3	....	.....	4648
4	.....	.....	4995
5	.....	.....	7053
6	....	....	8301

\*This seam has been since worked.

†Operations at the Joggins (as at Springhill) have been hampered by fluctuations in the thickness of the shale parting.

Year	Chaldrons	Bushels	Tons
1867	.....	.....	8477
8	.....	.....	10944
9	.....	.....	7095
1870	.....	.....	6852
1	.....	.....	10414
2	.....	.....	12191
3	.....	.....	19241
4	.....	.....	17434
5	.....	.....	11588
6	.....	.....	12491
7	.....	.....	10233
8	.....	.....	9640
9	.....	.....	8059
1880	.....	.....	11201
1	.....	.....	15873
2	.....	.....	18396
3	.....	.....	21269
4	.....	.....	22789
5	.....	.....	14630
6	.....	.....	18797
7	.....	.....	13386
8	.....	.....	43253
9	.....	.....	37935
1890	.....	.....	53409
1	.....	.....	53872
2	.....	.....	58535
3	.....	.....	64206
4	.....	.....	81717
5	.....	.....	95076
6	.....	.....	51360
7	.....	.....	72537
8	.....	.....	64113
9	.....	.....	58726
1900	.....	.....	55456
1	.....	.....	53352
2	.....	.....	46968
3	.....	.....	38768
*4	.....	.....	26848
5	.....	.....	37620
6	.....	.....	33969
7	.....	.....	32624
8	.....	.....	39087
	149	Persons employed	

\*Financial difficulties temporarily suspended wage payments. This caused a strike during which the pumps and boilers were abandoned and the mine was partially flooded.

Meanwhile, A.D. 1865, an American company had prospected the south side of Springhill. The position of their trial pits is shown on the maps of the Geological Survey of Canada. A survey of the Cumberland field by Woodhouse and Jeffcock, in 1865, included the Springhill district; prospecting was carried on upon the South side by a Welsh mining engineer about 1872; and, in that year, the Springhill Mining Company drove two slopes 50 chains apart on the "11 Foot" or "Black" seam, which dipped N. 60° W. 33-38,\* true meridian; (variation 21° 45' W.) The west slope was equipped with a single 16" cylinder, 4'6" stroke engine; the east, slope, at which the company's principal operations were concentrated, was fitted with engines of a heavier and more permanent type, and a 6 ft. furnace was built at the out crop to promote ventilation. The mine was connected with the Intercolonial Railway by five miles of rail, and, with Parrsboro, on the Basin of Minas, by the Springhill and Parrsboro Railway, in 1877. The acquisition of the adjoining coal areas held by the General Mining Association in 1879 extended the colliery to the dip in 1881; other contiguous coal was absorbed, and the sales increased so rapidly that by the year 1885 "Springhill Mines" had become the largest coal producer in Nova Scotia.

According to the State Papers of Canada the relations between capital and labor at Springhill about 1888 were:—

From an Overman's Standpoint:—

"Gets \$2 per day—paid fortnightly; usual time, eight hours a day's work. Company owns sixty or seventy houses, averaging three or four rooms and kitchen, the rent being from \$1.50, \$2.00 and \$2.50 a month. Company charges men 75 cents a head per load of one-half or three-quarters of a ton. Pays school tax, \$1; road tax, \$1; about 40 cents a year for poor and county rates; doctor's fee 45 cents for men of families, single men 35 cents a month;

\*This statement that the Springhill slopes were sunk on the Black seam, and the dip of latter (N. 60° W. 33') at the west slope is from the Geo. Survey of Canada; but the west slope was unwittingly sunk in an underlying seam, 9 ft. 9 in. thick, where cut in a stone drift from the upper seam, some six years later. The upper seam became split by 17 ft. of parting, and had to be worked in two divisions; the lower thinned to 3 ft. 8 in. on the west.

Variation in the height and splitting of the seam by increases in the thickness of the parting, e. g. from a wedge point eastward, until the upper and lower benches have to be worked separately is still a feature of mining at Springhill. As the main slopes and levels extended faults have been encountered, much close work, in which stone 3"—2" thick had to be moved, has been necessary, the crossing of "stone heads," that is close work previously driven and eventually filled with stone by roof pressure has interrupted regular mining, the dip of the coal has varied to excessively steep angles and the greater superincumbent pressure has increased the cost of maintainance.



boys do not pay doctor's fee until of age. Men select the doctor, who supplies medicine. Safety lamps are used, and no others; the mines are well ventilated. Company furnishes tools—eight picks a day, two shovels, maul wedge, and necessary boring tools. Men generally take tools down with them, sending them up in boxes. Boys are employed in mine, but none under twelve years, a Provincial law prohibiting younger being employed. Lowest pay of boys is 45 cents a day; after about one year would get 60 cents, 70 cents, or 80 cents, according to worth. Very few accidents in mines, and wages are not paid when men are laid up through accidents. There is a benefit society, the company contributing one-third or 50 per cent. of fund and membership being optional. Thirty cents is the universal fee, and a member gets \$2.50 a week for twenty-six weeks, payable fortnightly; men who pay 50 cents get \$4 if sick or get hurt. Death benefit \$60, and so much allowed to widow and children for one year. Inspector visits mines every month. Boys work eight or nine hours, some ten. Some 1,400 or 1,500 are employed; of these, about 100 or 150 are boys. Fines for disobeying orders or mining laws; offender would be taken before a stipendiary magistrate, the company making the charge. No fines are exacted for benefit of company. The difference in price in taking out different kinds of coal is 25 cents to 50 cents a box less for soft than hard. Box contains about 1,650 pounds. Two men and helpers would, in some places, dig twenty to twenty-two boxes a day. If boxes are not filled the amount is docked."

From Workmen's standpoint:

1. A miner—Average wages \$1.75—\$2.00 per day; last year about \$300 or \$400. Pays \$2.00 per month rent to company for three rooms; also taxes. Buys coal from company at 75c. per load.

2. A Driver—First turned the fan at 45 cents a day; now drives at 70 cents a day. Highest wages paid to drivers, \$1.25 per day..

3. A Miner—Complains of overcrowding in winter. For last three weeks had only three days' work, which is only worth one-half day cash, as there are too many men in mine. This could be remedied by not engaging so many; could get as much coal with less men. Has worked in Scotch mines, and generally had no idle time. Considers he was as well off there as here, but would be in a better position here with constant work. Pays \$2.50 rent, and is pleased with house. Has worked from 1s. to 1s. 8d. per ton and thinks 4s. per day would go farther than 6s. here, a four-pound loaf being 7d. or 8d. and beef 8d. or 1s. a pound; pays for beef here 8 to 14 cents. Potatoes about twice the price here. Rent in old country about 6s. a month for two rooms. Generally get coal for the hauling, but has paid 4s. a ton.

4. A Miner. Thinks \$1.60 rather than \$2 per day would be nearer the average than stated. Average wages for the last seven or eight years would be \$400 or \$450 a year. Lives in own house, but it would have taken a long time to buy if he had no help. Has his boys working in the mines; aged between twelve and thirteen. Should say provisions dearer here than in Halifax: granulated sugar, 9 cents a pound; roast beef and steak, 9 to 14 cents per pound. Uses flour for bread, at \$5.50 a barrel; potatoes, 50 cents per bushel; butter 20 cents to 21 cents per pound by the tub; eggs, 15 cents a dozen. Pays voluntarily \$1.10 to minister's subscription; it is not compulsory. Has heard evidence that miners get coal at 74 cents a load. Does not live far from pit, but pays 88 cents a load for only half a ton, not three-quarters. He pays higher because he is beyond the west slope. Does not think it fair to make the difference. Men have complained, but got no remedy.

5. A Miner.—Average daily wage last year \$1.60 to \$1.65.

6. A Loader.—Wages \$1.30 per day of 8-10 hours paid out of cutter's wages by company. Last month earned \$20.15. Pays doctor 45 cents per month. Buys oil for lamps costing about 65c per month.

From Manager's standpoint:

Over 1,400 men and boys are employed in mines—about 1050 underground. Mine has been wholly shut down for about ten days a year on an average. Men lost time for want of cars to take coal away on the railroads. Does not employ boys under ten, the youngest being between  $11\frac{1}{2}$  and 12 years; the law fixes age from ten to 12 years. Boys are employed at opening doors upon the levels—not hard work. Probably 150 men have bought property from company, some have paid and some have not. Company owns about 120 tenements containing three, four and five rooms; three rooms, \$2 per month; four rooms, \$2.50; five rooms, the same. Two tenement blocks cost \$600, independent of land. Company pay taxes. Wages have increased since eight years ago—not much difference; pay roll per month, \$17,000-\$19,000, sometimes \$20,000; charge miners for coal 72 cents to 74 cents per ton. If men were not docked for short measure or dirt they would not be so careful. He approves of eight hour system. Price paid for cutting coal is regulated by inspection—25 cents to 80 cents a box of 1,650 lbs. Price arranged after consultation with men. Men do not believe in co-operative stores; had two once. Average wages for miners in September and December, 1887:

Average wages for miners for September, 1887; we have three slopes:—

North Slope, average .....	\$2 03 $\frac{1}{3}$	per day
West Slope       " .....	2 12 $\frac{1}{3}$	"
East Slope       " .....	2 05 $\frac{1}{5}$	"

Average wages for December:—

East Slope, average .....	\$2 15	per day
West Slope       " .....	1 92 $\frac{1}{4}$	"
North Slope     " .....	1 85 $\frac{3}{4}$	"

Total day's labor 315,911; persons employed 1,133; average number of days worked by each person employed 279 days.

Pits worked 275 days.

Pits idle 38 days—public holidays 10 days.



The men lost a great many days during the summer months of their own accord.”\*

The sales of Springhill Coal have been, to date :—

Year.	Tons.	Labor employed.	Average daily output—Tons.
1872	1000	19	14
3	5728	64	25
4	30813	123	128
5	47048	178	182
6	67731	214	280
7	86096	266	320
8	94030	347	451
9	80456	324	429
1880	121291	339	542
1	151747	392	620
2	188016	451	695
3	177673	508	678
4	215833	662	873
5	311790	719	1288
6	389476	1005	1653
7	439134	1133	1622
8	364036	1355	1889
9	366743	1046	1680
1890	377572	1213	1773
1	406192	1370	1780
2	361984	.....	.....
3	288920	1474	2190
4	394499	1274	2000
5	324259	779	1360
6	367651	1056	1600
7	265589	905	1040
8	287792	855	1389
9	346795	999	1533
1900	403170	1094	1588
1	359603	1406	1792
2	401777	1537	1986
3	450056	1454	1910
4	423443	1772	2604
5	412109	1792	2130
6	435574	1700	1995
7	280475	1538	1577
8	337175	1726	1817

\*The relations between capital and labor at Springhill since 1888 have not been as harmonious as in the Pictou and Cape Breton coalfields; and between that year and 1909, 21 strikes interfered with the progress of mining. These disputes have largely originated in the variation in the physical conditions of mining at Springhill. Vide page 173. The collieries are wrought board and pillar.

The following table is said by one authority to represent the average daily miners' wage at Springhill colliery between 1883 and 1909 :—

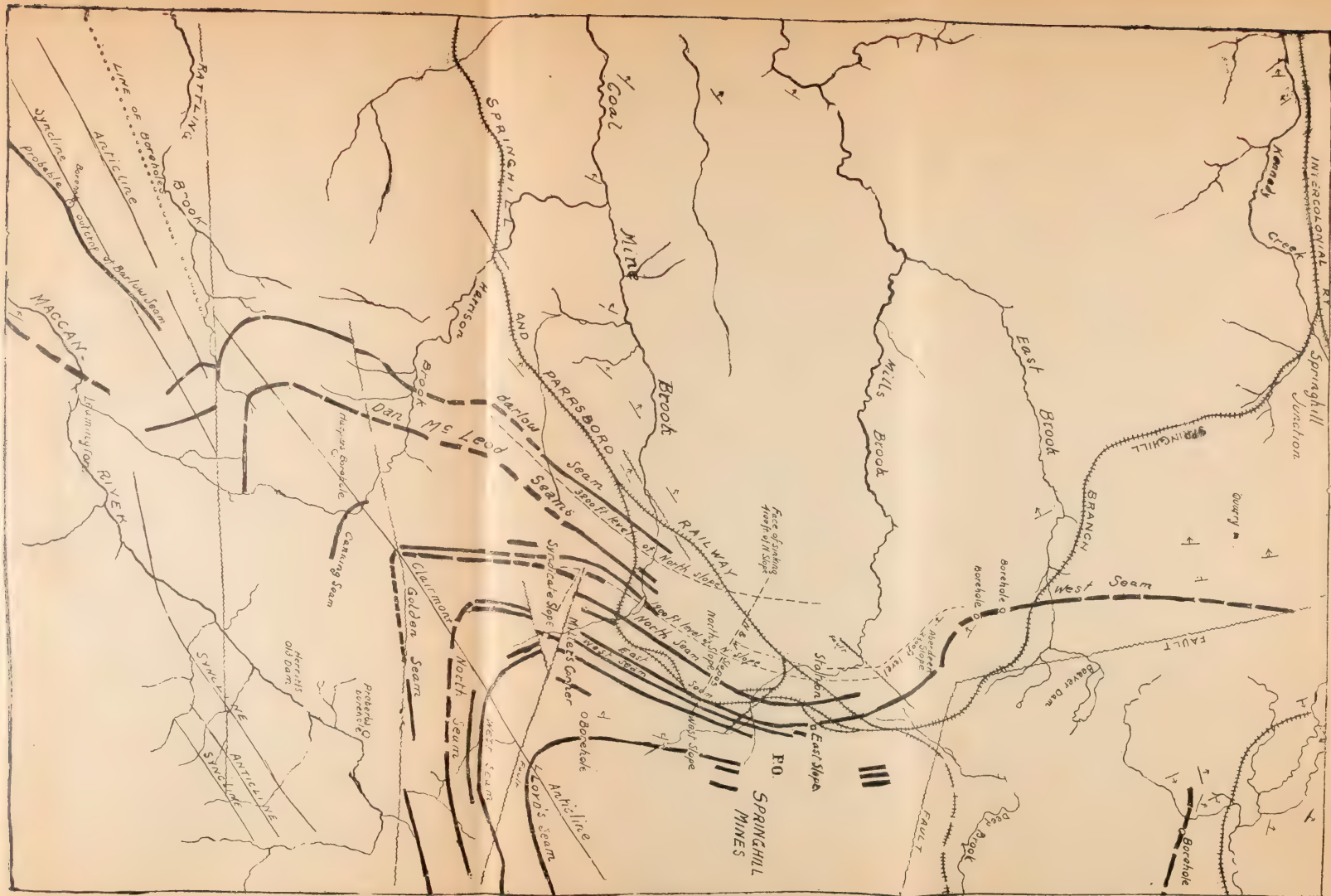
1883.....	\$1 98	1897.....	\$1 83
1884.....	2 03	1898.....	1 92
1885.....	1 90	1899.....	1 90
1886.....	1 87	1900.....	2 27
1887.....	2 02	1901.....	2 51
1888.....	1 96	1902.....	2 63
1889.....	2 02	1903.....	2 88
1890.....	2 01	1904 average for 11	
1891.....	2 08	months.....	2 98
1892.....	1 96	1905 .....	2 97
1893.....	2 00	1906 .....	3 18
1894.....	1 91	1907 .....	3 14
1895.....	1 83	1908 .....	3 00
1896.....	1 94	*1909 .....	\$2 81-2 97

The earnings of twelve miners during part of A.D. 1907 are said to have been :—

*Springhill Mine.*

1907.	APRIL.			MAY.			JUNE.			JULY.		
	Days worked.	Rate per day.	Amount earned.	Days worked.	Rate per day.	Amount earned.	Days worked.	Rate per day.	Amount earned.	Days worked.	Rate per day.	Amount earned.
M.....	21	\$3 30	\$ 69 30	24	\$3 76	\$ 92 16	24	\$4 40	\$105 64	21	\$4 73	\$ 99 36
N.....	20	5 27	105 46	23½	5 02	116 65	16	5 72	91 51	20	4 88	97 66
O.....	20	4 32	86 34	23	4 24	97 66	23	3 98	91 63	33	3 48	114 48
P.....	22	4 90	107 88	26	4 84	125 83	22	5 11	112 51	24	4 69	112 68
Q.....	21	4 03	84 69	26	3 07	79 80	24	4 47	107 36	23½	5 08	116 47
R.....	19	4 15	78 76	25	3 07	76 73	23	4 47	102 90	22½	5 12	115 35
S.....	22	4 06	89 37	23	3 07	70 59	23	4 47	102 90	22½	5 12	115 35
T.....	22	3 65	80 43	25	3 67	91 74	23½	4 37	102 88	23	3 72	85 71
U.....	19	3 61	68 59	25	3 39	84 83	21	3 43	72 02	24	3 98	95 60
V.....	22	4 28	94 30	25	3 66	91 61	22	4 02	88 53	21	4 53	95 30
W.....	20	4 55	91 07	22	4 82	106 18	22½	4 06	91 50	21½	3 70	79 56
X.....	22	4 06	84 37	24	4 39	105 44	19	3 61	68 68	24	3 40	81 56

\*During January to July, i. e. up to a strike declared by "The United Mine Workers of America," during which the mines, pumps and boilers were abandoned by the workmen. The advance in wages between 1900 and 1909 from \$2.27 to \$2.81 or \$2.97 is said to have been accompanied by a decrease in the daily produce of the miner from 4.80 tons to 3.67 or 4.02 tons, due in part at least, to variation in mining conditions.



Outline of Springhill Division of Cumberland Coalfield. After Geo. Survey of Canada. Course of Seams delineated in dark lines : probable Course in broken lines.





The annual earnings of families living under one roof at Springhill during the same period are said to have been :—

1907 Family.	April.	May.	June.	July.	Total for 4 months.	Rate of earnings per annum.
A...	\$215 60	\$340 10	\$284 30	\$255 71	\$1095 71	\$3287 13
B...	207 24	290 36	243 74	248 60	989 94	2969 82
C..	289 16	338 76	322 34	276 28	1226 54	3679 62
D..	152 62	212 28	169 10	167 41	701 41	2104 23
E...	114 93	181 30	170 59	158 88	625 70	1877 10
F...	146 85	195 07	171 36	149 75	663 03	1989 09
G...	141 06	175 95	168 96	172 87	658 84	1976 52
H..	111 00	113 38	141 59	135 68	501 65	1504 95
I...	206 61	205 01	201 89	233 56	847 07	2541 21
J...	168 57	207 04	198 93	197 95	772 49	2317 47
K..	139 69	147 09	129 73	139 76	556 27	1668 81
L...	149 86	210 99	205 60	193 26	750 71	2252 13

Average number of workers in each of above families,  $4\frac{1}{2}$ .

Company's houses rent at \$2, \$2.50, \$3, \$4, \$5, \$6 and \$7 per month for tenement houses, according to size and location, and \$8 per month for single or detached houses.

Nut coal is sold employees at 80 cents per load, hauled and delivered into coal bins—less than the cost of production."

## CHAPTER X.

The fold holding the Pictou Coalfield trends westward, south of the Cobequid axis ; and signs of coal appear on the north side of Minas Basin, associated shales and sandstones, holding characteristic fossils of the Joggins carboniferous series. Coal, dipping N. at Kemptown, Colchester is reported to be 4 ft. thick, the lower 2 ft. clear and good and at North River, two small seams 100 yards apart, said to be about 3 ft. thick, one of which is reported 3 ft. at the bottom of a slope 40 feet down, exhibit in their dip, S.  $45^{\circ}$  and  $35^{\circ}$ , the synclinal structure of the Colchester coalfield. This structure, apparently at least a double syncline parallel to the hills, is more clearly exposed on Debert River, the cross section of which, doubtless fairly illustrates the structure, as it does the character, of the strata on the North, Chiganois, Pine Brook, Folly, Great Village and Economy Rivers.

The westward pitch of the main Pictou field, exposes at Debert River the lower coal seams of the Pictou series, associated with conglomerate, etc., similar to that in the Millstone Grit series on McLeod's Brook, near Westville. (Vide Hartley's No. 1, Section Geo. Survey of Canada, Report 1866-9, p. 60.)

The close Millstone Grit resemblance of local grey sandstones, shales and conglomerates, is visible on the neighboring Folly River, and the fossils in similar strata in the Chiganois River, similarly exhibit features of Millstone Grit plants.

The association of not dissimilar coal seams with similar conglomerate, in the Millstone Grit series of the Sydney coalfield, may be observed between Victoria Mines and the south bar of Sydney Harbor, also above the Tracy seam, Mira Bay, Vide pages 185 and 176, report Geological Survey of Canada, A. D. 1874-5. The Colchester field is evidently disturbed and shifted, like the Pictou coalfield, by northerly and southerly undulating spurs from the Cobequids, between which the local streams apparently



descend to the Bay (a phenomenon which, if also present on the northern side of the Cobequids westward of Springhill, must affect the calculations upon which the recent explorations in that district have been based). The affect of these transverse folds upon the Colchester coal series is apparently visible in the upthrow faulting on the west level of Debert Colliery, also in the exposure of coal, striking approximately at right angles to the main trough, in the same locality.

Signs of coal are reported between Debert River and Cape Chignecto, Bay of Fundy; but these exposures, so far as they have been examined, do not indicate richer coal deposits than those above referred to.

Coal was almost continuously worked in this field, ten miles from Truro, near the Tatamagouche Road, during the winters of 1834-5; and, during the winter of 1843, a 30 foot shaft, 7' diameter was sunk by Mr. John Archibald, to a 2' 6" seam, at Salmon River. Samuel Cunard, the Nova Scotian Agent of the General Mining Association of London, England, threatened to prosecute Mr. Archibald if he further extended the mine, and the works were consequently abandoned. Mr. Cunard's interference excited great dissatisfaction in Colchester, as fuel was annually growing scarcer in the Truro and Onslow districts and the cost of hauling coal from the Albion mines, in Pictou County had reached the almost prohibitive figure of 40 shillings per chaldron. Colchester consequently became one of the centres of the successful political agitation against the continuance of the General Mining Association's monopoly, which has been fully referred to elsewhere.\*

The coal on the Debert and Chiganois Rivers was examined during A.D. 1883; and 20 years later, (1903) the Colchester Coal & Railway Company opened a small colliery on the northerly dip (28°) of a seam on the east side of Debert River. The seam (vide Mines Report) measured about 4' 6" of excellent coal, free from sulphur and suitable for coking. The following is an analysis by Mason, of Halifax, N. S.:—

\*Thirty-five years later a Colchester gentleman (The Hon. B. F. Pearson) projected the present modern development of the coal industry south of Sydney Harbor, from which has proceeded the present larger Nova Scotian Iron and Steel industry and the ample revenues now enjoyed by the province.

Moisture lost at 110° C.....	3.45
Volatile matter .....	30.40
Fixed Carbon.....	59.25
Ash.....	6.90
Sulphur.....	.43

Evaporative Power: One pound of coal on complete combustion will evaporate 11.68 pounds of water. The coal burned with a long, clear flame and left a pale grey ash.

The Inspector of Mines stated (Report 1904) that the seam thickened to 5' of coal and 8" of fireclay, 360 feet down the slope; and at 245 feet its dip increased. The existence of three underlying seams, viz:—3' 0" : 2' 6" and 3' 6" thick was proved a short distance below the pavement of the west level of the mine by diamond drill borings in 1905; and the southward extension of the field has been proved by six boreholes ranging from 118 to 715 feet deep.†

Coal was carried to market over a branch line from the mine to the Intercolonial Railway, on July 9, 1907; during the same year, a stone drift from the lower level of the colliery opened out the underlying or "Second" seam, which was found to average about 3 ft. 2 in. of good coal, and during 1908 levels were extended in the latter. The official records show that the output of this colliery during 1908 was:—

Production.	Sales.	Consumption at Engines.
Tons	Tons	Tons
3951	2103	1848

The Mines Report intimates that a larger output could be secured.

\*The last two seams on this line, probably actually represent, correcting the drill returns. 1 ft. 9 in. and 2 ft. 4 in.

†Mines Report 1906. The Author, in his reconnaissance of the district, about 1904, considered this southerly extension probable from the evidence then available.

The following boreholes put down near the colliery are the most interesting of the series sunk on that district:—

No. 4 Hole, 600 ft. N. E. of No. 3 west side of river.

	Ft.	In.
Surface shale and sandstone.....	40	..
Coal .....	7	3
Clay or soft slate.....	5	6
Coal.....	4	10
Shale and sandstone .....	60	5
Total.....	118	...

No. 5 Hole, 200 ft. south of No. 4.

Surface, shale, sandstone, conglomerate..	195	6
Coal .....	8	8
Shale, sandstone, conglomerate.....	107	6
Coal and shale.....	1	..
Shale and sandstone.....	107	7
Coal .....	6	9
Grey shale .....	9	..
Total.....	428	...

Number 4 hole was bored on an angle of  $60^{\circ}$ —the dip of the strata was approximately  $36^{\circ}$  N.

Number 5 hole was bored on an angle of  $82^{\circ}$  N—the dip of the strata close to the surface was  $31^{\circ}$  N. and at 385', only a few degrees from perpendicular.

The Kemptown end of the field was bored in 1904 with the following results:—

	Ft.	In.
Surface .....	11	..
Red and gray slate .....	21	..
Sandstone and shale .....	538	...
Coal.....	1	5
Shale and sandstone .....	328	7
Total.....	900	..



A slope is said to have been driven at Kemptown upon the following seam:—

Coarse coal with clay shale.....	2' 0"
Clear, strong coal.....	2 0
Total thickness of seam..	4 --

and the following is said to be an analysis of the lower bench, by Mason, Halifax, N. S.:

Moisture lost at 110° C.....	0.50
Volatile matter.....	12.50
Fixed Carbon.....	76.10
Ash.....	10.80
Sulphur.....	.534

Evaporative Power. One pound dry coal, on complete combustion, will evaporate 12.28 pounds of water. The coal burned with a short luminous flame, did not cake, and left a buff-colored ash; found by test to be capable of melting steel.

No statistics of the production of coal known to have been intermittently carried on in the Kemptown district during the past 60-70 years, are available.

# Analyses of Pictou & Cumberland Coals.<sup>†</sup>

The following analyses of Pictou and Cumberland Coals were published in 1902 :—

## PICTOU FIELD.

SEAM OR MINE.	Fast or slow coking.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.	Sulphur.	Spec. Gravity.	Theor. Evap. Power.
Main seam, average of 31 analyses* . . .	S	....	23.65	62.61	13.61	.....	.....	.....
“ Ford pit .....	.....	1.48	24.28	66.50	7.74	.55	1.294	9.13
Albion Mines .....	S	1.05	26.19	63.41	9.35	1.48	1.31	8.68
Acadia Coal Co.—McGregor pit, slack	S	1.50	26.80	58.00	13.70	1.73	.....	.....
“ “ Ford Pit .....	.....	1.50	25.90	54.30	18.30	.78	.....	.....
Acadia Colliery .....	S	2.10	32.27	57.57	7.55	.51	1.320	.....
Drummond Colliery—Top coal .....	.....	.72	29.93	60.35	9.45	.26	1.309	8.29
“ “ Fall coal .....	.....	1.56	31.69	60.32	7.56	.43	1.328	8.29
“ “ 1st bench .....	.....	1.80	33.53	55.39	10.50	.58	1.327	7.61
“ “ 2nd bench .....	.....	1.31	29.97	60.31	8.67	1.05	1.343	8.29
“ “ 3rd bench .....	.....	1.43	30.76	59.89	8.79	.564	1.335	8.27
“ “ Coarse bench .....	.....	1.58	32.81	37.16	31.03	.....	1.765	.....
Deep seam .....	S	.75	20.34	68.50	10.41	.945	1.330	9.39
“ .....	S	1.30	25.44	61.65	10.25	.861	1.330	.....
“ .....	.....	2.54	20.46	68.50	8.50	1.69	1.845	9.41
McGregor seam .....	.....	.....	22.50	65.70	11.80	.....	1.334	9.03
“ .....	.....	.....	23.30	70.00	6.70	.....	1.301	9.62
Intercolonial Mine .....	S	1.52	29.46	60.19	9.10	1.625	1.330	8.24
Montreal and Pictou Mines .....	.....	4.40	24.95	61.07	9.58	.....	.....	8.39
“ “ “ .....	.....	5.47	19.93	68.55	6.05	.....	1.360	9.41
McBean seam, east side of East River .....	.....	1.57	29.29	52.36	16.76	.....	.....	.....
“ .....	.....	2.67	28.65	49.66	19.42	.....	.....	.....
“ .....	.....	2.67	27.20	54.86	15.27	.....	.....	.....
“ .....	.....	1.94	23.95	57.17	16.94	.....	.....	.....
“ .....	S	.86	20.95	64.95	13.24	.85	.....	8.90
McKay seam, north part .....	S	1.62	22.86	68.18	7.34	.53	.....	9.35
“ south part .....	.....	.90	22.50	65.28	11.32	1.72	.....	8.97
“ .....	.....	None	29.72	62.28	8.00	.....	.....	.....
“ .....	.....	None	29.98	62.15	7.87	.....	.....	.....
Richardson seam .....	.....	.76	38.84	55.81	5.09	.....	.....	.....
Greener .....	S	1.22	22.96	65.61	10.21	Trace	.....	8.99
Pottery .....	.....	.57	19.24	72.76	7.43	.65	.....	9.97

\*Average of samples taken every foot across the section of the seam.

†These analyses and those on pages 121-2 are from the records of The Geological Survey of Canada.

## CUMBERLAND FIELD.

SEAM OR MINE.	Fast or slow coking.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.	Sulphur.	Spec. Gravity.	Theor. Evap. Power.
Joggins .....	S	2.50	36.30	56.00	5.00	.....	.....	.....
Maccan .....	S	.....	37.00	59.17	3.83	.....	.....	.....
Styles .....	S	4.05	33.72	55.83	6.40	.....	.....	.....
" .....	S	3.72	33.24	52.15	10.89	.....	.....	.....
Springhill—Main seam, 11 feet—								
Band No. 1 .....	S	.98	30.84	60.73	7.45	.85	1.31	8.33
" No. 2 .....	S	.76	32.22	60.91	6.11	.56	1.30	8.40
" No. 3 .....	S	1.21	33.81	63.13	1.85	.79	1.28	8.65
" No. 4 .....	S	.30	29.19	67.95	2.56	1.21	1.27	9.28
" No. 5 .....	S	.63	28.90	65.16	5.31	1.85	1.29	8.92
" No. 6 .....	S	.90	34.56	60.59	3.95	.89	1.28	8.32
" No. 7 .....	S	1.34	33.64	59.86	5.16	1.40	1.29	8.20
" No. 8 .....	S	.56	30.27	60.89	8.28	2.65	1.33	8.35
" No. 9 .....	S	.41	28.54	63.63	7.42	2.25	1.32	8.99



## ANALYSIS OF COALS FROM N. S. COLLIERIES MADE DURING 1903-04†

MINE	Volatile	Fixed Carbon	Ash	Sulphur	Moisture
Joggins.....	40.89	48.33	10.78	5.72	
Minudie.....	36.15	52.45	9.60	5.04	1.80
Chignecto.....	39.75	48.75	9.95	6.02	1.55
Strathcona Mines.....	37.36	52.25	10.39	4.47	
Springhill, straight in level }					
No. 2 slope, E. side }					
“ 2 “ Minto seam.....	34.09	59.25	6.66	1.14	
“ 3 “ West 3800 ft. ....	37.44	56.85	5.71	2.36	
“ 3 “ “ 2600 “ .....	35.36	59.72	4.92	.96	
“ 3 “ “ 2600 “ .....	33.42	58.58	8.00	1.12	
“ 3 “ East 2600 “ top ....	36.44	58.54	5.02	1.10	*
“ 3 “ “ 2600 “ West.....	36.05	57.38	6.57	2.38	
“ 2 “ Aberdeen Seam, E level	32.20	60.49	7.31	1.02	
“ 2 “ “ “ W. “	31.08	58.30	10.62	2.62	
Avg. Springhill Coal.....	34.51	58.64	6.85	1.59	
Intercolonial, Main Seam.....	25.73	65.35	8.20	1.10	.72
Marsh Colliery.....	34.53	55.48	9.99	1.26	*
Vale Colliery.....	28.80	55.30	14.50	.92	1.40
Acadia, Main Seam.....	28.09	60.77	9.99	1.24	1.15
Acadia, Mines average.....	26.80	62.20	9.70	1.15	1.30
McGregor Seam.....	28.37	61.13	10.50	1.43	
Cage Pit Seam.....	29.98	59.34	10.78	.87	
Third Seam.....	30.69	53.34	15.97	1.37	
Port Hood.....	34.67	56.39	8.94	1.10	*
Mabou Mines 7 ft. Seam.....	35.90	53.30	8.70	1.88	2.10
“ “ 8 “ “ .....	34.25	56.40	6.95	1.85	2.40
“ “ 15 “ “ .....	37.50	51.20	9.05	5.77	2.25
“ “ 5 “ “ .....	35.65	49.55	11.95	5.20	2.85
Average Mabou Mines.....	35.82	52.61	9.16	3.67	2.40
Broad Cove.....	45.55	47.09	7.36	4.91	*
New Campbellton.....	35.50	51.55	8.95	5.50	4.00
Old Sydney Mines, Main Seam....	36.27	57.05	4.76	2.01	1.92
Sydney Mines, Lloyd's Cove.....	36.11	57.25	2.83	3.14	3.81
Lingan.....	34.05	59.97	3.68	1.71	2.32
Dominion No. 1.....	31.25	60.75	6.95	1.88	1.05
Reserve.....	30.75	63.70	4.65	1.81	.90
International Harbor Seam.....	37.20	56.90	5.10	3.11	.80
Dominion No. 2, Phalen Seam....	32.45	61.45	5.25	1.99	.85
“ “ 3, “ “ .....	31.85	62.20	5.00	1.67	.95
Caledonia.....	30.85	62.05	6.40	2.32	.70
Gowrie & Blockhouse Collieries ...	36.00	57.70	5.20	3.82	1.10

†Communicated to the Author by the late E. Gilpin, H. M. Inspector of Mines.

\*Non-coking.

## THE NOVA SCOTIA COAL TRADE.

Production and Sales by Collieries, Year ended September 30th, 1908.

COMPANY.	COUNTY.	PRODUCTION.	SALES.	Colliery Consumption.	
				Workmen.	Engines.
Dominion Coal Co.....	Cape Breton.	3816958	3386333	41901	229192
Nova Scotia Steel & Coal Co.....	"	662350	613295½	13921	31630
Cumberland Railway & Coal Co.....	Cumberland.	416132	337175¼	24110	54747
Nova Scotia Steel & Coal Co.....	Pictou .....	47845	41886	.....	5959
Acadia Coal Co.....	" .....	413782	330757	9201	75023
Intercolonial Coal Co.....	" .....	315590	263817	6927	29901
Maritime Coal Ry. & Pr. Co., Chignecto	Cumberland.	15839	10319	1358	3822
Maritime Coal Ry. & Pr. Co., Joggins....	"	51130½	39087¼	715	8590
Inverness Railway & Coal Co.....	Inverness...	283704½	244690¾	4288	23532
Mabou & Gulf Coal Co.....	" .....	19250	9087	430	6544
Sydney Coal Co.....	Cape Breton.	4801	4607	157	85
McKay Mining Co.....	"	13560	11554	667	1339
North Atlantic Collieries.....	"	58777	46480	1269	7919
Port Hood Coal Co.....	Inverness...	99700	82202	1680	12428
*Great Northern Coal Co.....	Cumberland.	2726	2295	72	339
Minudie Coal Co.....	"	48397	38744	1186	2526
Strathcona Coal Co.....	"	23928	20447	570	2909
Atlantic Grindstone & Coal Co.....	"	861	714	147	.....
Colchester Coal Co.....	Colchester ...	3951	2103	.....	1848
*1287 tons were produced by the E. Ripley Co., the previous owners. The systems of Mining were: Cape Breton, Bord and Pillar; Pictou, Bord and Pillar and longwall; Colchester, Bord and Pillar; Cumberland, Bord and Pillar, longwall and longwall advancing.				108599	498333
		6299282	5485583½		

## NOVA SCOTIA COAL SALES, 1827 TO 1908 (INCLUSIVE).

Year.	Tons.	Year.	Tons.
1827	12,149	1868	453,624
8	20,967	9	511,795
9	21,935	1870	568,277
1830	27,269	1	596,418
1	37,170	2	785,914
2	50,369	3	811,106
3	64,743	4	749,127
4	50,813	5	706,795
5	56,434	6	634,200
6	107,593	7	697,665
7	118,942	8	693,511
8	106,730	9	688,628
9	145,962	1880	954,659
1840	101,198	1	1,035,014
1	148,298	2	1,250,179
2	129,708	3	1,297,523
3	105,161	4	1,261,650
4	108,482	5	1,254,510
5	150,674	6	1,373,666
6	146,506	7	1,519,684
7	201,650	8	1,576,692
8	187,643	9	1,755,107
9	174,592	1890	1,786,111
1850	180,084	1	1,849,945
1	152,499	2	1,752,934
2	188,076	*3	1,485,924
3	217,416	†1	2,019,742
4	234,812	5	1,831,357
5	238,215	6	2,047,133
6	253,492	7	2,013,421
7	294,198	8	2,135,397
8	226,725	9	2,419,137
9	270,293	1900	2,997,546
1860	322,593	1	3,119,335
1	326,429	2	3,898,626
2	395,637	3	4,621,074
3	429,351	4	4,544,609
4	576,935	5	4,475,284
5	635,186	6	5,194,590
6	558,520	7	5,046,690
7	471,185	8	5,485,583

Sales prior to 1827 appear on page 14.

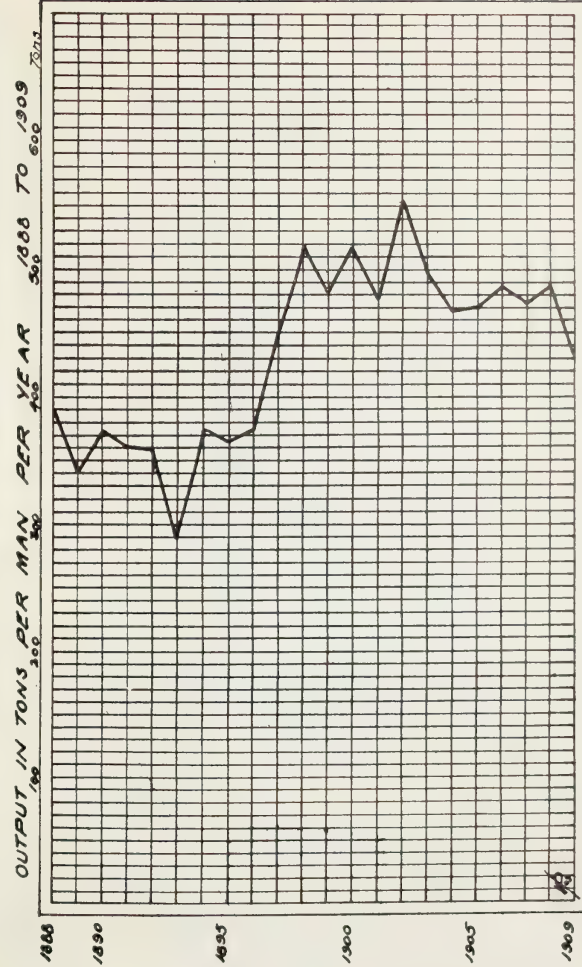
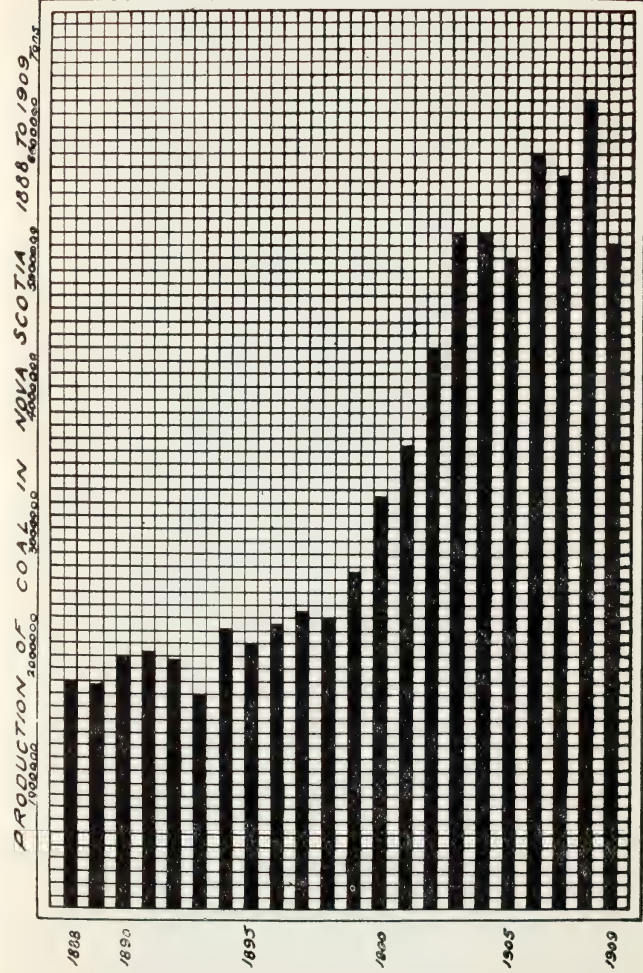
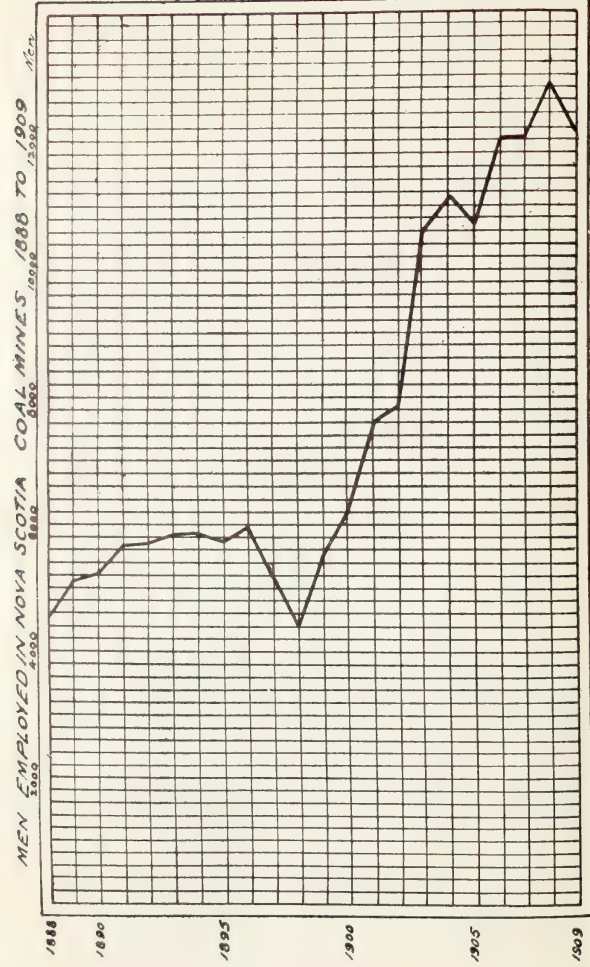
\*Nine months only. †Fiscal year begins Oct. 1st and ends Sept. 30th. (Chap. 4, Acts, 1893).



# NUMBER OF PERSONS EMPLOYED AT THE NOVA SCOTIA COLLIERIES.

Year.	Number.	Tons of Coal Raised.
1871	2469	673,242
2	3522	880,950
3	4362	1,051,467
4	4282	872,720
5	3777	781,165
6	3229	709,646
7	3180	757,496
8	3135	770,603
9	3034	788,271
1880	3332	1,032,710
1	3567	1,124,270
2	4235	1,365,811
3	4635	1,422,553
4	5013	1,389,295
5	4446	1,352,203
6	4585	1,502,611
7	4367	1,670,838
8	4651	1,776,128
9	5167	1,756,279
1890	5324	1,984,001
1	5746	2,004,784
2	.....	1,942,780
3	5890	1,682,713
4	5936	2,200,235
5	5793	2,089,245
6	6012	2,235,472
7	5175	2,320,916
8	4487	2,281,454
9	5612	2,642,333
1900	6626	3,238,245
1	7663	3,625,365
2	8062	4,366,869
3	11092	5,255,247
4	11659	5,247,135
5	10780	5,050,420
6	12123	5,866,605
7	12107	5,730,660
8	12933	6,299,282

The above are from the Annual Mines Reports. According to "Employment Statistics," at page 25 (Tables) Mines Report 1908, 18,460 workmen were employed during that year in and in connection with the Nova Scotia Coal Industry.







## ACCIDENTS AT THE NOVA SCOTIA COLLIERIES.

Year	Cape Breton		Pictou		Cumberland		REMARKS
	Killed	Injured	Killed	Injured	Killed	Injured	
1867	5	11	5	1	1	1	
8	4	4	3	3	1	.....	
9	.....	11	4	1	.....	.....	
1870	3	2	1	.....	.....	.....	
1	4	5	1	1	.....	.....	
2	8	10	5	7	.....	.....	
3	6	.....	67	.....	.....	.....	[collieries
4	1	.....	5	.....	1	.....	31 persons injured at the various
5	.....	7	2	10	.....	.....	15 persons injured at the various
6	1	13	1	1	1	4	collieries
7	4	6	1	7	1	2	
8	8	6	3	3	1	1	
9	2	.....	1	.....	.....	.....	[collieries
1880	2	1	52	7	.....	1	10 persons injured at the various
1	1	1	2	7	2	1	4 other persons injured at various
2	1	1	1	2	.....	2	collieries
3	1	3	10	5	6	1	[collieries
4	1	.....	3	2	1	.....	5 other persons injured at various
5	...	6	13	13	2	6	8 other persons injured at various
6	1	15	1	5	2	2	collieries
7	3	12	3	3	4	7	
8	1	15	1	8	.....	7	
9	6	4	.....	3	1	11	
1890	5	9	4	10	.....	3	
1	3	17	.....	5	.....	10	
2	6	8	3	4	1	15	
3	4	9	.....	5	.....	10	
4	9	9	4	12	2	20	
5	6	17	1	12	3	7	
6	7	6	.....	5	2	8	
7	5	14	.....	8	2	7	
8	5	15	5	4	3	2	
9	17	16	2	10	.....	3	
1900	16	27	4	10	2	3	Total Casualties.
1	4	15	4	7	1	9	
2	11	17	7	11	3	10	Killed Injured
3	22	55	5	13	4	5	Cape Breton ..... 261 653
4	12	64	3	17	5	7	Pictou ..... 236 237
5	12	77	4	4	4	10	Cumberland ..... 62 179
6	20	69	3	5	4	2	Others injured at
7	34	76	2	6	2	2	various collieries 73

## CHAPTER XI

The home markets, tributary to Nova Scotia coal, lie along the Atlantic coast of Canada, in Prince Edward Island, in the St. Lawrence, and at the inland points touched by the Eastern Canadian railway systems. The railways are becoming increasingly important consumers; and, like the growing maritime towns, afford a certain market at fair prices. The total tonnage of Nova Scotian coal supplied to the State Intercolonial Railway—the most important of the maritime main lines—during the year ending September 30, 1908, was 647,571 tons\*

The foreign markets are almost exclusively confined to Newfoundland and the United States.

The following table shows the distribution of Nova Scotian coal, during the year ending September 30, A.D., 1908; and, on comparison with the similar table, for A. D., 1892, on page 63 exhibits the progress of the home and foreign coal trade of Nova Scotia during the past 17 years:—

COAL SALES BY COUNTIES—YEAR ENDED SEPT. 30TH, 1908.

	Cape Breton	Pictou	Cumberland	Inverness	Colchester	Total
Nova Scotia by Land ..	1102531	337468	97346½	73283½	422	1611050½
Nova Scotia by Sea.....	243760½	9979	1382	84459½	....	339581
Total, Nova Scotia .....	1346291½	347447	98728½	157742½	422	1950631½
New Brunswick.....	166657½	74159	236621	31212	1681	510330½
Newfoundland .....	179790	24690	.....	2582	.....	207062
Prince Edward Island...	38740	.....	.....	24590½	.....	63330½
Quebec .....	1667747	191982	68064½	119845	.....	2047638½
West Indies .....	.....	.....	.....	.....	.....	.....
United States.....	456518	1091	41825½	.....	.....	499634½
St. Pierre.....	8907	.....	.....	.....	.....	8907
Other Countries .....	4697	.....	.....	.....	.....	4697
Bunker .....	193352	.....	.....	.....	.....	193352
	4062900	639369	445239	335972½	2103	5485583½

\*For the year ending September 30, 1893 - 160,141 tons.

The expansion of the home market depends very largely upon the growth of manufacturing industries in Eastern Canada. When the manufacturing opportunities peculiar to Eastern Canada are better realized numerous important coal consuming industries will be established; and the home coal markets may consequently be expected to expand more rapidly in the future than they have done in the past. To extend public knowledge of the openings for manufacturing in Nova Scotia, the Author has written and had published, among other material, a pamphlet entitled "Nova Scotia as a Manufacturing Field.", which has been favorably received at home and abroad.

The principal foreign market for Nova Scotian coal, has always been, in New England, where 7,000,000—8,000,000 tons of bituminous coal are annually consumed; but the extension of the coal trade in that direction has been systematically restricted by the United States taxes upon foreign bituminous coal:—

According to "Taylor's statistics of coal," these were as follows, A. D. 1789-1846.

Tariff	A. D.	1789	\$	56	per ton of 28 bushels=2240 lbs.		
"		1790		84	"	"	"
"		1792	1	25	"	"	"
"		1794	1	40	"	"	"
"		1812	2	80	"	"	"
"		1815	2	80	"	"	"
Act of April	1816-1824		1	40	"	"	"
Act of May	1824-1833		1	68	"	"	"
Tariff		1833	1	40	"	"	"
"		1842	1	75	"	"	"
"		1846		30%	Ad Valorem		

Those 1850-1908 appear parallel to the exports of Nova Scotian Coal to the United States.



# NOVA SCOTIA COAL EXPORTED TO THE UNITED STATES. AS PER MINES REPORT

YEARS.	TONS.	DUTY.	YEARS.	TONS.	DUTY.
1850	118,173	24 ad.	1880	123,423	75
1	116,274	"	1	113,728	"
2	87,542	"	2	99,302	"
3	120,764	"	3	102,755	"
4	139,125	Free	4	64,515	"
5	103,222	"	5	34,483	"
6	126,152	"	6	66,003	"
7	123,335	"	7	73,892	"
8	186,743	"	8	30,198	"
9	122,720	"	9	29,986	"
1860	149,289	"	1890	50,854	"
1	204,457	"	1	25,431	"
2	192,612	"	2	13,883	"
3	282,775	"	3	16,099	"
4	347,594	"	4*	79,837	40
5	465,194	"	5†	73,097	40
6	404,252	"	6‡	174,919	"
7	338,492	\$1.25	7	106,279	67
8	228,132	"	8	98,027	67
9	257,485	"	9	153,188	"
1870	168,180	"	1900	624,273	"
1	165,431	"	1	590,086	"
2	154,092	75	2	751,382	"
3	254,760	"	3	968,832	"
4	138,336	"	4	713,170	"
5	89,746	"	5	652,538	"
6	71,632	"	6	769,775	"
7	118,216	"	7	616,312	"
8	88,495	"	8	499,634	"
9	51,641	"	9§		

NOTE.—The quantities given for the years 1852 to 1872 are on the authority of the Board of Trade, Philadelphia, and are probably underestimated.

\*Nine months only.

†NOTE.—After August 1st., 1894, duty on Round Coal, 40 cents, on Culm and Slack, 15 cents.

‡Fiscal year begins October 1st., and ends September 30th.

||On July 21th, 1897, the duty was made 67 cents.

§Act of Aug. 5, 1909, 45 cents per 2240 lb. ton; slack or culm passed through a half inch screen in the ordinary way at the mine, 15 cents per like ton.

These taxes have checked the exportation of Nova Scotia coal to New England; and when supplemented by an arrangement between the miner and carrier by which American coal has been sold cheaper in Boston than in New York or Philadelphia, it is still more difficult for Nova Scotia coal to compete.

The protests of those New England coal consumers, who recognized that Nova Scotia is the only country that can compete with and regulate the price of American coal in the north eastern States have so far been unable to procure the removal of the coal duty, although Congress has recognized the national importance of Nova Scotia coal by admitting it duty free during temporary scarcity of fuel in the United States. The opposition of the American colliery owners to admission of Nova Scotian coal into New England duty free, will, however, abate with the increasing growth of population, and industry in mid and mid eastern America, north and south of the international boundary; and should the American duty be unconditionally, removed, or, as is more likely, should reciprocal access to each other's coalmarkets be established for a fixed period, the exports of Nova Scotian coal to the United States could be greatly increased. The loss in part of the St. Lawrence market, for Nova Scotia coal under such an arrangement would doubtless be inevitable; but the advantage of access to the larger New England market at all seasons of the year would probably compensate the Nova Scotian colliery operators for their sacrifices in the river markets.

The following table shows the comparative importance of the United States and St. Lawrence markets for Nova Scotian coal between 1873 and 1908:—

# COMPARATIVE VALUE OF ST. LAWRENCE AND NEW ENGLAND MARKETS.

Year	Exports of Nova Scotia Coal to the Province of Quebec.				Exports to the United States.
	From Pictou Tons 2240 Lb.	From Cumberland Tons 2240 Lb.	From Cape Breton Tons 2240 Lb.	Total to Quebec Tons 2240 Lb.	Tons 2240 Lb.
1873	106,816	.....	80,213	187,029	254,760
4	116,188	.....	46,081	156,269	138,336
5	148,151	.....	41,177	189,328	89,746
6	85,126	.....	32,037	111,163	71,634
7	64,997	.....	29,906	94,903	118,216
8	55,502	.....	28,208	83,710	88,495
9	103,217	8,844	41,410	153,471	51,641
1880	141,487	33,497	63,732	238,716	123,423
1	83,437	35,448	149,643	268,528	113,728
2	125,521	58,561	198,892	382,974	99,302
3	145,527	46,483	218,595	410,605	102,755
4	139,934	104,243	152,605	396,782	64,515
5	115,363	163,300	215,254	493,917	34,483
6	95,499	188,935	254,328	538,762	66,003
7	.....	202,121	353,427	555,548	73,892
8	114,383	182,927	381,013	685,321	30,198
9	73,261	177,461	381,074	631,796	29,986
1890	90,216	181,008	480,463	751,686	50,854
1	63,319	183,573	528,394	773,286	25,431
2	97,334	143,184	505,519	746,037	13,883
3	74,499	107,041	538,265	719,805	16,099
4	86,967	124,950	664,926	876,843	79,837
5	85,250	79,912	573,633	738,795	73,097
6	52,987	73,351	662,264	788,802	174,919
7	46,138	52,107	773,602	871,847	106,279
8	96,801	23,347	822,611	942,759	98,027
9	80,502	44,577	902,395	1,027,474	153,188
1900	120,455	52,296	761,295	934,045	624,273
1	103,243	56,780	855,411	1,015,434	590,086
2	125,185	59,233	1,049,930	1,234,348	751,382
3	119,552	82,668	1,161,771	1,363,991	968,833
4	120,904	129,507	1,406,625	1,657,036	713,170
5	115,268	70,403	1,265,087	1,450,758	652,538
6	169,931	35,742	1,459,185	1,664,858	769,775
7	171,356	53,876	1,388,926	1,609,592	616,312
8	191,982	68,064	1,667,747	2,047,638	499,634

From Inverness to Province of Quebec, 1907, 95,434; 1908, 119,845 tons



The apparent incongruity of admitting free American Coal which relatively under the usual conditions of the U. S. A. coal trade is not a dangerous competitor of the Nova Scotian Collieries, and at the same time maintaining the present duty against British Coal (which carried to Canada at ballast rates of freight has always been a dangerous competitor to the provincial collieries,) appears, however, to present difficulties to the immediate adoption of reciprocal relations in coal with the United States.

Experience has proved that Nova Scotian coal is also suitable for the north European markets; and an outlet in that direction could be arranged, if back cargoes were secured for the colliers—a by no means difficult problem. The Mediterranean market is considered less suitable for our smoky coals; but a certain tonnage could be marketed there if adequate discharging facilities were erected at the principal ports.

The West Indian and South American markets, could also be entered, if desired; but the most desirable because the most stable market for Nova Scotian coal is the home market, i. e., the market under our own control; and the nation is wisely promoting its development by encouraging manufacturing in Canada.

## CHAPTER XII

The area of the coastal coalfields of Nova Scotia was formerly believed to be limited to high water mark. The popular belief that coal could not, as a rule, be advantageously followed under the sea from the Nova Scotian coast, though shaken by the submarine extension of the Sydney Mines and by similar operations south east of Sydney Harbor, was strengthened by the abandonment of the latter. After the submarine coalfield at Morien was opened by the Author amid expert censure and popular incredulity, some of the principal mines south east of Sydney Harbor were, however, extended under the sea; and it is now perceived that, as the Author contended, submarine coal mining can be conducted, at least as advantageously, from Cape Breton as from Great Britain.

The necessity for special education on submarine coal mining in Nova Scotia is, therefore, obvious; particularly on reference to the following schedule, restricting the size of the pillars, the width of the rooms and the breadth of the cross-cuts in the submarine mines of the Province, framed by the Deputy Inspectors of Mines in A.D. 1904. This set of rules, contrary to established practice, reduces the amount of coal removable under the sea, as the risk of submarine mining disappears, and their enforcement must impede the development of the submarine coalfields of Nova Scotia:—

\*“A majority of coal mining experts declared the proposed operations rash and full of risk and hazard.”—*Mining Record*, Stellarton, N. S., June 12, 1904. Vide p. 31, line 9 et seq.

## SCHEDULE.

Cover in Feet.	HARBOR SEAM.		HUB & PHALEN.		% Coal left in.
	Room.	Pillar.	Room.	Pillar.	
200 ft.	20 ft.	27 x 75	20 ft.	30 x 75	51
250	"	27 x 75	"	30 x 75	51
300	"	30 x 75	"	34 x 75	54
350	"	33 x 75	"	38 x 75	56
400	"	36 x 75	"	42 x 75	58
450	"	39 x 75	"	46 x 75	60
500	"	42 x 75	"	50 x 75	61
550	"	45 x 75	"	54 x 75	63
600	"	48 x 75	"	58 x 75	64
650	"	51 x 75	"	62 x 75	65
700	"	54 x 75	"	66 x 75	66
750	"	57 x 75	"	70 x 75	67
800	"	60 x 75	"	74 x 75	67
850	"	63 x 75	"	78 x 75	68
900	"	66 x 75	"	82 x 75	69
950	"	69 x 75	"	86 x 75	69
1000	"	72 x 75	"	90 x 75	70

The size of pillars and the width of rooms in workings under submarine areas below the 180' limit to be governed accordingly.

"All deeps, headways, levels and crosscuts to be restricted to 12' wide."

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The progress and revenues of Nova Scotia, and the industrial expansion of all Eastern Canada are so intimately associated with the coalfields of Nova Scotia that the study of their submarine extensions, the structure and coherency of the sections above sea level, the dips of the synclinal axes, the contiguous ocean soundings, the channels of rivers flowing through the land sections into the ocean, and, particularly, the proportion of coal that can be safely extracted under the ocean at varying covers, as ascertained



by the accumulated experience of modern submarine mining, should form a special branch of technical education in Nova Scotia.

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The submarine coalfields of Cape Breton are merely former land coalfields, now inundated by the sea. The conversion of the land into the submarine coalfields of Cape Breton, accelerated, doubtless, by subsidences of the earth between Newfoundland and Cape Breton, and in the Gulf of St. Lawrence, is still going on. From observations near Sydney Mines by the late Richard Brown, over a period of thirty years, it appears that the conversion of dry into submarine coal land in that district has proceeded at the rate of at least five inches per annum. At that rate nearly 175 feet of the present ocean bed was land coalfield when Columbus discovered America in A. D. 1492. The land coal has probably passed under the sea much faster, at Cranberry Head, and between Low Point Light House and the Barrasois; for a mass of strata 20 yards square by 15 yards high has slipped off into the sea at the former, and another mass, half a mile long, 200 yards wide and twenty yards high, in the latter district, during recent years. The shore is steadily disappearing at Big Glace Bay, and a sea wall has been erected there to preserve it; and the northern shore of Cow Bay is likewise slowly disappearing under the ocean. Further south, on the American coast, the sea has similarly covered part of Delaware, U.S.A., at the rate of nine feet annually; a quarter of a mile of South Carolina has disappeared under the sea in three years, and, in the British Isles, a piece of the Kingdom as large as the County of London has been in like manner covered by the ocean during the past hundred years. The process by which so immense an area of the Cape Breton coalfields has passed under the Atlantic, is therefore obvious; and there can be no doubt that, before the existing collieries are exhausted, a further acreage of land coal will be added to the submarine field. The probable duration of our submarine coalfields and the tonnage of coal extractable from



Plan and section to illustrate the undersea extension of the Sydney Coalfield. Compiled from the Geological Survey of Canada's surveys above sea level and the Author's observations in land and submarine collieries at Morien and in the Morien district. Heavy lines indicate the landward course of the coal seams; broken lines their presumed course. Broken lines approximately indicate the submarine continuation of the seams; and the formation of the coalfield under the sea is approximately shown by dark lines in the section.

The rupture of the submarine coalmeasures by the Morien Anticline (Flint Island district) and the continuation of the Morien Basin in the Glace Bay Basin is also shown in the section.







them under the sea, is clearly a subject of much practical importance. The seaward dip of the coalmeasures at Port Morien, as ascertained by survey along the axis of the basin and by the ocean soundings, continues, without visible interruption, until the submarine field comes under the influence of the Newfoundland uplift. The coal in that basin, in common with the extension of the same seams through the adjoining districts, therefore stretches a great distance seaward, protected from the erosion of the St. Lawrence by the Pre-Carboniferous Highlands of Cape Breton; and there can be no doubt that it can be followed seaward to the mechanical limit of mining, as at present understood.

From observations made in the Morien district, the local mechanical limit of submarine coal mining is probably about 12 miles under the Atlantic. Elsewhere in the Sydney field it is doubtless as distant, and, taking the Sydney coalfield as a whole, exclusive of seams thinner than 3' or 4', the Author estimates, as stated elsewhere, that between its landward boundaries and the mechanical limit of submarine mining, as at present understood, there are fully 9,000,000,000 tons of coal available for the local collieries.\*

This vast quantity of coal, lying on the edge of water routes to the most populous markeet on the globe, is practically inexhaustible; and the Sydney Coalfield may consequently be regarded as one of the world's greatest coalfields.

\*The Author drew the attention of a member of the Government of Nova Scotia to the local Regulations for mining submarine coal in panels or districts surrounded by barriers of coal reserved from the lease. This, he pointed out, was unnecessary and wasteful of available coal and the coal royalties. The Author further pointed out that our submarine collieries could be more advantageously wrought by specific regulations applied to each as experience in the winnings accumulated rather than by hard and fast rules equally applicable to all, as is now the case.

Mr. T. E. Foster, an eminent British submarine mining authority whom the Government, soon after invited to advise them, has confirmed the Author's views.

The revision of the Mines Regulations, to prevent the unnecessary abandonment of large bodies of barrier coal, etc., is essential for the conservation of the provincial revenues, as well as for the convenience of the mine operator.

## CHAPTER XIII

Coal mining in Nova Scotia has not been uniformly profitable, since A. D. 1827. As recently as A. D. 1875 most of the coal companies complained that their collieries were kept open at a loss; others have, in recent years, earned inadequate profits for the proprietors; and at all the collieries the tendency of the cost of operating is upwards. Nevertheless, the chance of sharing the feasible profits of the Nova Scotia coal industry, continues to attract capitalists to the local coal fields. The popular idea of these profits is doubtless exaggerated; averaged over the decennial fluctuations of the trade, since A. D. 1827, the profits of the Nova Scotian collieries, never more, have at times been less than the owners were reasonably entitled to receive.

Statistics of these profits are not readily available; but, it is stated that the General Mining Association of London, England, operators of the Pictou and Sydney Mines collieries, passed its dividends on approximately £300,000 expended capital, between A. D. 1827 and 1845, made no fair profits between A. D. 1867 and 1873, and paid its shareholders dividends averaging only about  $5\frac{1}{2}$  per cent. (i. e., about 28 cents per ton on the coal output) between 1877 and 1899. The company reduced its capital nearly 50 per cent. by refunds to the shareholders, between A. D. 1874 and 1894; but these refunds were apparently not made out of the profits of mining coal in Nova Scotia. These average returns were not adequate for the risks taken; but the increase of the Mining Association's dividends to a more normal level, averaging nearly 9.50 per cent., during the last 9 years of the period under review, indicates that the stable, annual distributable profits of the Cape Breton coal trade on the north side of Sydney Harbor had then practically reached the standard of 10 per cent., considered necessary for coal mining risks, not annually decreased by a Capital Redemption Fund. The subsequent profits at Sydney Mines, in

association with State subsidised iron and steel making, are indicated by the payment to the 1st and 2nd lien proprietors of 6 per cent., and a capital redemption fund; to the 3rd lien shareholders 8 per cent., without a capital redemption fund, and by the sacrifice of part of the 8 per cent. earned upon the interest of the junior shareholders during the past eight years, to improve the property.

The profits of the collieries on the opposite side of Sydney Harbor were probably adequate, between A. D. 1858 and 1866; but after the abrogation of the Reciprocity Treaty, and the combination of a high coal duty with special railway rates on U. S. A. coal into New England, they suffered heavy reverses, aggravated by a shrinkage of probably 4-5th in the market value of their securities. After British coal was excluded from Eastern Canada, and as coal consuming industries were established their profits improved, and as stated elsewhere, between 1888 and 1892, the average earned profits (exclusive of the profits of the mine stores, railways, etc.) at four of the principal collieries south of Sydney Harbor, were about 40 cents per ton on their output, no allowance being (apparently) made for the redemption of the capital invested in their shrinking assets. The subsequent profits upon the 35,000,000 tons of coal mined south of Sydney Harbor by the Dominion Coal Company, including the profits of the "Company Stores," steam ships, railways, real estate, etc.) before disbursing the interest on the Bonded or Share capital, or making payments to the capital redemption fund, have been as follows:

Year ended			
Dec. 31, 1893	11 Months	\$	246,709
Feb. 28, 1895	14 "		333,091
" 6	12 "		318,377
" 7	" "		474,988
" 8	" "		513,277
" 9	" "		606,570
" 1900	" "		609,066
" 1	" "		639,946
" 2	" "		1,460,154



Dec. 31, 1902	10 Months	\$ 1,308,857	Rental and Int.
"	"	{ 808,604	" "
" 3	12 "	{ 905,120	" "
" 4	" "	1,417,479	
" 5	" "	1,477,152	
" 6	" "	1,091,815	} Redemption of capital (sinking fund)suspended
Dec. 31, 1907	" "	2,062,368	
" 8	" "	2,660,163	
		<hr/>	
		\$16,933,736	

Out of these profits, averaging about 48 1-3 cents per ton on the output of the collieries, the 1st lien proprietors have received 6 to 5 per cent. plus (during part of the period) an arrangement for the redemption of their capital; the 2nd lien proprietors, 8 to 7 per cent. (from which they have been conventionally expected to make an adequate deduction for the gradual redemption of their capital), and the junior shareholders, an irregular return. Since 1893 the collieries south of Sydney Harbor, notwithstanding the large expenditures incurred to increase their productive-ness, and a rise in the price of coal have, therefore, earned on the average practically the same profits, as they earned during the preceding five years of lower prices and lesser demand.

These profits, though substantial, are less than those expected, and it would appear that the increased efficiency of the mines and the rise in the market value of coal since 1893 have done little more than compensate the colliery proprietors for the concurrent rise in the cost of material and labor, the increased cost of maintenance, and the special expenditures called for by the more rapid exhaustion of the choicer mining areas within the zone of most economical production. The collieries opened, since 1893, outside of the two large companies in Cape Breton, (two of which have been closed after the expenditure of probably \$1,500,000) have not been more favorably circumstanced than the older mines; and their records confirm the Author's belief that stable profits can be earned in the Nova Scotia coal industry only by the

\*This increase in the price of coal nominally \$1.00 per ton since 1893 has averaged 60c. per ton since 1899, (vide sworn evidence in Court of Stipendary Magistrate, Halifax, October 19, 1909) or in larger centres even less.

judicious expenditure of adequate capital, in the highest standard seams, contiguous to sheltered harbors or cheap railway haulage, after the elapse of a reasonable period for the organization of the business.

The profits of mining upon the neighboring mainland, where the shrinkage in the value of colliery shares has been as excessive as 98 1-2 per cent., less readily ascertainable, are, to some degree, indicated by the fact that the Drummond Colliery, established at Westville, Pictou, A. D. 1867-1869, (which for 20 years paid no dividends upon \$500,000 gold originally invested in it) earned for its proprietors, in 1908, 7 per cent. upon that capital; 7 per cent. upon a Preferred capital of \$219,700, and 5 per cent. upon \$242,000 First Mortgage Debentures, plus \$3,000 towards the redemption of the latter. These earnings, from the first two classes of which, according to the rules applicable to mining investments, a proportion should be set aside by the recipients, towards the redemption of their capital, probably represent the present maximum feasible earning capacity of the mainland collieries of Nova Scotia. These mines, (adversely affected prior to 1899 by the increasing competition of the less expensive Cape Breton mines,) are now benefiting by the general improvement in the Nova Scotia Coal Trade, also to a notable extent, by their proximity to the present increasing demand in the markets along the maritime mainlines, in which prices are more remunerative than in the larger centres dominated by the Cape Breton mines. The local coal markets of the mainland collieries must increase in importance as these inland communities become larger centres of activity, and the coal requirements of the railways, connecting them, increase; their proportionate share of the water borne coal trade is also assured; and, notwithstanding the increased cost of maintenance etc., referred to elsewhere, the best mainland collieries like those of Cape Breton therefore have a profitable future before them.

## CHAPTER XIV.

Although the Nova Scotia market for firebricks is rapidly expanding, very little systematic attention has been paid to Nova Scotian fireclay.

Fireclay may be obtained from the underclays of most of the coal seams in the Sydney coalfield; but very few of the deposits have been analyzed. The following is an analysis of a fireclay at Langan, C. B.:

Silica .....	55.20
Alumina .....	32.10
Iron Oxides .....	1.87
Titanic Acid .....	
Lime	} .....
Magnesia	
Alkalies	
Combined Water .....	5.30
Moisture .....	
Carbonic Acid .....	
Organic Matter .....	

The fireclay underlying the "Gowrie" seam at Port Morien has been used in the colliery furnaces for many years, with very satisfactory results. At Watson Brook, Coxheath Hills, a compact, massive, slightly foliated, white, weathering slaty felsite has been experimented with. The hardness of the substance is said to be about 6, the specific gravity 2,770, and an analysis, after drying, at 100° C., as follows:

Silica .....	76,260
Alumina .....	19,152
Ferric Oxide .....	Trace.
Magnesia .....	.170



Lime .....	.552
Soda .....	.159
Potash .....	.100
Water .....	4,300
	<hr/>
	100,693

The rock is not difficult to grind, has a rather soapy feeling when reduced to a very fine powder, and is slightly plastic when moistened with water. The addition of from one-half to one per cent. of lime is said to produce a very refractory brick. Similar rock is founded in several localities in the Coxheath and East Bay Hills, at Big Pond, the Gillis Mill Brook, near St. Peter's Road, westerly of East Bay Chapel, in Forks Lake Brook, and in the Sporting Mountain.

Three geological horizons in Pictou County yield fire clay, viz :

1. The Upper Coal measures.
2. The Middle or Productive Coal measures.
3. The Lower Carboniferous measures

and, in the fields near Byers Brook, French River, a light colored, slaty felsite, that might make a good fire clay, has been found, perhaps however, not abundantly.

On the shores of Merigomish Harbor a bed of fireclay seven feet thick, overlain by fifteen inches of coal is said to be free from pyrites and calcareous matter; resists heat well, and has been partially tested with success.

The following is a partial analysis of a fire clay from the Pictou coal measures :

Silica .....	58.00
Alumina .....	32.00
Iron Oxide .....	4.00
Lime .....	1.00

And the following, of a fireclay from the Deep seam, in the same series:

Silica .....	51.15
Alumina .....	22.57
Iron Oxides .....	6.48
Titanic Acid .....	1.75
Lime .....	1.27
Magnesia .....	1.55
Alkalies .....	2.66
Combined water .....	4.23
Moisture .....	2.88
Carbonic Acid .....	5.04
Organic Matter .....	1.16

Forty thousand bricks were manufactured from a 4' bed of fire clay, overlying the McGregor seam, for coke oven construction, by the Halifax Company, in A. D. 1879. The clay was considered an excellent plastic clay for lining blast and puddling furnaces.

The 4' 6" bed of fire clay underlying the "Third" seam, at the Drummond Colliery, has been opened by a continuation of the tunnel from the Scott Pit; and bricks have been manufactured at a plant at the mine. They have proved satisfactory, though not suitable for the blast furnaces on Sydney Harbor.

Two samples of fire clay from the Lower Carboniferous series have been found to contain considerable quantities of calcareous matter; others appears to be of good quality. The following is an analysis of a sample of fire clay from Springhill:—

Silica .....	50.47
Alumina .....	32.69
Iron Oxides .....	8.01
Titanic Acid .....	1.88
Lime .....	1.85
Magnesia .....	2.11
Alkalies .....	1.96
Combined Water .....	1.03
Moisture .....	
Carbonic Acid .....	
Organic Matter .....	

An extensive deposit of fire clay is said to lie about one mile S. E. of Marshalltown Church, Digby County, and specimens are reported to be non-calcareous and fusible with difficulty.

The following is an analysis of a deposit at Stewiacke:

Silica .....	45.611
Alumina .....	14.000
Moisture .....	1.000
Carbonic Acid .....	
Organic Matter.....	
Iron Oxide .....	6.100
Titanic Acid .....	
Lime .....	Trace.
Magnesia .....	1.096
Alkalies .....	
Combined Water .....	6.550
Sand .....	25.689

Extensive deposits of clay, believed to have been derived from the decomposition of granite, lie at Middle Musquodoboit, Halifax County. Brick manufactured from this clay, with the addition of 25 per cent. of Silica sand, at St. John, P. Q., were cut up in 24 hours when tested in the Blast Furnace. The clay is, however, said to make a good ordinary fire brick, when mixed with the above percentage of silica sand.

The large deposits of silicious or infusorial earth in many of our provincial lakes may ultimately prove suitable for the manufacture of refractory bricks, linings, etc.

The importance of procuring a native supply of high standard fireclay is so obvious that the Mines Department of the Government of Canada would do a public service by systematically testing all the known deposits of fireclay in Eastern Canada.



## CHAPTER XV.

Trades unions, presumably the successors of the Old English Guilds, suppressed in the reign of Henry VIII, but kept alive, in one form or another, originally arose out of legal or other contests to enforce the trade customs of the re-established Guilds; and one of their earliest complete types was perhaps the "Institution" organized by the cloth workers at Halifax, England in A. D. 1796. They were constantly exposed to hostile legislation, as dangerous associations to restrain trade etc., but this persecution doubtless helped to consolidate them; and in A. D. 1871 they received legal protection under the "Trades Union Act." Eight years later this modern representative of the historic English Guilds was introduced into Nova Scotian coalfields, by the miners at Springhill. Early in A. D. 1879 the Springhill Mining Company reduced wages, and some months later, precipitated a general strike by attempting to further reduce them. Mr. Robert Drummond, one of the overground managers, learning that the company's principal customer had not demanded a reduction in the price of coal, sympathized with the men's objection to a reduction in wages; and, after they compelled the Springhill Company to re-establish the schedule of wages in force prior to the first reduction, he framed the ritual and bye-laws of a trades union called the Provincial Workman's Association. This Association was formed "to protect the interests of miners and workers about coal or other mines;" and, at the solicitation of the "Pioneer Lodge," Mr. Drummond became the Grand Secretary. In three weeks, i.e., in September 1879, the new Association consisted of the following lodges:—

"Pioneer," at Springhill; formed on Sept. 1, 1879.

A Lodge, at Westville; formed on Sept 11, 1879.

"Fidelity," at Stellarton; formed on Sept. 18, 1879.

"McBean," at the Vale Mine; formed on Sept. 22, 1879.

;and, by October 17th, the total membership had reached 646 persons. Lodges, after some delay, were formed at the Cape Breton mines; and the Provincial Workman's Association eventually became the responsible representative of the Nova Scotian colliers. This legitimate descendent of the historic Guilds of the Motherland was established under circumstances, in many respects similar to those under which trades unionism was introduced into the British coal mines. Opposition to the establishment of colliers trades unionism proved formidable in a country like Nova Scotia, where the colliers were peculiarly dependent upon the mine owners, owing to the long winter season; and it took various forms calculated to influence the men; notably at Westville where suitable meeting places were practically closed against the Association. This hostility to the unions, in at least one instance, so open that the mine owners declined to recognize the Provincial Workman's Association, was based upon the fear, that the P. W. A. would demand a schedule of wages which would jeopardize the capital invested in the collieries and the compulsory payment of a rate of wages dictated by the Lodge at Springhill, seemingly supported this view. The hostility of the public, also under existing conditions, peculiarly susceptible to the influence of the mine owners, was based upon the fear that the opposition of the mine owners to the Provincial Workman's Association would precipitate conflicts between capital and labor, disastrous to private interests. The objections to trades unionism at the Nova Scotian collieries therefore appear to have been similar to those raised against its introduction into the British mines. They would doubtless have been better founded if the Provincial Workman's Association had been directed by a less capable leader than Mr. Drummond. Mr. Drummond studied the economic condition of the Nova Scotian coal industry, in order to

intelligently direct the conduct of the workmen, and, as a result, his policy was usually pacific. The Springhill strike of A. D. 1879, in which he exerted a tranquilizing influence, is said to have been the most orderly that had occurred in Nova Scotia up to that time; and the strikers preserved their decorum, even when they were ordered by the Sheriff to vacate the company's houses. During the ensuing ten years there was comparative quiet at Springhill; and a majority of the strikes which subsequently occurred at that colliery, usually owing to the special difficulty of arranging the numerous different rates for the changing character of the working places, were not sanctioned by the Provincial Workmen's Association. Excepting trivial disagreements, liable to occur under any circumstances, there have been only two strikes in thirty years in the Pictou coalfield—one at the Drummond colliery, which was settled in favor of the men by the directors of the company, the other, at all the collieries except the Drummond, for an increase of ten to twenty cents per day in the wages of over-ground laborers, who found it difficult to maintain their families on 80 to 90 cents per day. For twenty-five years after 1879, the only strike in Cape Breton, sanctioned by the Provincial Workman's Association, occurred at the Lingan mine of the General Mining Association of London. That unfortunate dispute lasted one year and ended in a compromise; but, as it was subsequently admitted that a fuller knowledge of all the circumstances in London would have prevented it, the attitude of the P. W. A. seems to have been at least as reasonable as that of the Mining Association.

Mr. Drummond's moderation was based upon the obvious consideration that wages could not be materially increased at collieries competing in such limited markets, exposed to the competition of British coal imported at "ballast" rates of freight and embarrassed by an annual ice blockade. He realized that the provincial coal trade could only thrive with cheap labor and he therefore helped the men to realize that thrift could be made to benefit



them nearly as much as increased rates. The following description of conditions at Nova Scotian collieries about 1888, from Mr. Drummond's standpoint, is from the State papers of Canada:—

“There exists a strong—though not general—feeling among the men in favor of fortnightly payments. The association procured last session the passage of an Act by the Nova Scotia Legislature providing for compulsory arbitration between workmen and managers, the men to chose two arbitrators, the managers one, and the three a fourth, three of whom form a quorum. The penalty is a forfeiture of fourteen days' pay to every man employed if the manager refuses to comply with the arbitrators' decisions, and forfeiture of fourteen days' wages to the company by every man similarly refusing. In Cape Breton the sworn unquestioned statements in the Dominion franchise returns for 1887, proved that only three or four of the miners earned \$300 that year, which was an average one. Since the formation of the union the boys have not been beaten by the foremen, nor are the men now sworn at. Miners, as a class, have greatly improved in sobriety and good behavior. During last ten years, owing to the union, 2,000 men have assembled at a pic-nic and not one of them got drunk. Twelve years should be the minimum age for working in mines, and a doctor's certificate as to the physical capacity should be required from every child employed, and also the ability to read and write. The system of apprenticeship should also be introduced. To learn mining takes three or four years, and under the present system an inexperienced stranger will be given the better paid work of cutting in preference to a trained boy. Industrial schools should also be established, giving technical education, according to locality. Fourteen lodges are under the grand council of the Provincial Workman's Association, containing 3,000 nominal members. The great majority are not in good standing, the men in Cape Breton being idle from December until May, partly from the ice blockade, partly from the lack of railways and partly from the new system of putting in enough men in

summer to supply the whole year. During these months they are earning nothing, except by a little banking, and so cannot pay their dues. Explosions have had the same result. About ninety lives have been lost within the last five or seven years."

In his organ "The Journal-News" (now the Stellarton "Mining Record") Mr. Drummond urged the Nova Scotian Government to establish night and mining schools at the collieries, where mine workers might be educated and trained for more responsible positions at the collieries. The former were not a success; but the mining schools established by the Hon. W. S. Fielding under local teachers, as suggested by Mr. Drummond, have supplied the coal industry with a competent class of colliery managers. Mr. Drummond's services in the framing of the mining regulations now in force in this province are well known; and his ultimate elevation to the Legislative Council of Nova Scotia may be regarded as a public acknowledgement of his usefulness to the country.

Since Mr. Drummond severed his connection with the Provincial Workman's Association (A.D. 1898), he has contributed to the historical literature of the province a sketch of the progress of the mining classes of Nova Scotia during the previous sixty years, from which the following are extracts:—

"The Nova Scotian miner of 60 years ago bore the reputation of being rough, rude and regardless. In many cases he was a law unto himself and adhered to customs which would ostracize him to-day. In Cape Breton the Lingan miners, celebrated pay days and the succeeding days by repairing in companies to Lingan Bar, carrying buckets of rum, with tin pints or tin dippers to serve as glasses. A "royal time" came to them every month, when it was fit to bide out doors, and at times, too, when it was unfit. Old residents of Albion Mines tell of the times when any stranger who attempted to pass the Cross Roads got very rough handling. But all that is changed; there is no comparison between the miner of to-day and him of sixty years ago. The transformation may be

said to be wonderful. Of course, there has been advance among other classes of workmen, but the advance is not so remarkable, from the fact that the miner had a longer and heavier hill to climb. The Nova Scotia miner has made notable progress, whether viewed from a moral, mental, material, social, physical or educational standpoint.

Formerly he was little short of a machine. Others did his thinking for him. If he had any politics they were those of his master. His reading was limited. In too many cases he could not read, for his youth had been spent in the pit, and not in school. To-day the miners must have their information direct, and not second-hand. Almost every man is a politician, but neither bigoted nor blind. The miner's progress may be in part due to his better surroundings. The miners' houses of the early days were squally affairs. Some of them were rough log huts, low and musty. The miner's house of to-day is a neat wooden cottage, with a plot of ground attached, suitable for a good-sized garden. They are adapted for various sized families. They have some, if not all modern conveniences. One company is putting in town water into new buildings, while another company is supplying its tenants with electric light.

Material progress, as a rule, brings social advancement; at any rate, such has been the case with the Nova Scotia miner. He is now well received and spoken of in circles which formerly kept him at arm's length—the longer the arm the better. Of course, among all classes, there are the thrifty and thriftless, the industrious and those indifferent to work. It would be untrue to say that many of each class cannot be found among our mine workers, but of late years habits of thrift and industry have been acquired and fostered more largely in proportion by mine workers than in any other class. In proof of this statement, I point to the number of houses now owned by colliery workers. In illustration, let me select a town in each of the three older mining counties. In Springhill there are no fewer than three hundred and twenty-



two houses owned by mine workers; this is a very large number in proportion to the number of employees, say 1,000. It is doubtful if in any coal mining town on the continent so large a number are owned by workmen. In some parts of the United States, take the Hocking Valley, for instance, many of the workmen own the houses they live in, but these houses are not within the colliery precincts, so to speak, but at distances varying from two to five miles. The owners are small farmers, as well as miners, which is not the case with Springhill. In Westville, Pictou County, according to the assessment roll of this year, 264 houses are owned by mine workers, a number sufficient to accommodate about a third of the population, as given in last census. At Sydney Mines there were, at the beginning of the year, 250 houses owned by mine workers, and as "a house of my own" seems to be the correct phrase in that town, the number may be doubled within a year. But besides owning a house, many a Nova Scotia miner is owner of "his own horse and buggy"; a fondness for horses is born in him; he knows a good one, and is not content with any other.

Legislation has done much for the British miner. It is safe to say it has done more for the Nova Scotian. It has given him better air, and improved the conditions under which he works in various ways. But perhaps the most important part played by legislation is the establishment of mining schools, which has, to an astonishing degree, stimulated his desire to obtain knowledge, to be a master in the theory, as well as the practice, of his calling. The thirst for education, if I may not say knowledge, is evident by the large numbers who yearly go up for examination by the Board appointed for granting certificates, entitling successful candidates to hold official positions. I have not the figures, but I judge the number who might have obtained certificates since the Board was established must be about a thousand. The examinations are not easy; on the contrary, the questions to be answered are difficult; embracing such subjects as geology, chemistry and

mathematics. When one looks at some of the questions, which have been rightly answered, he is forced to the conclusion that the Nova Scotia miner is a born mathematician. At the examinations lately held to grant certificates to colliery engineers, no fewer than seventy-eight candidates passed successfully, six of the number receiving first-class, which entitles them to take charge of a plant of 500 H. P. or over; and thirty-one second-class, entitling them to take charge of any less horse-power plant. When it is remembered that there are not more than a dozen and a half large collieries in operation, one is forced almost to the conclusion that every man at a colliery boiler or engine in Nova Scotia is fired with a laudable ambition.

The Nova Scotia miner is better paid than miners elsewhere. According to the returns for 1902 of the British Board of Trade, the actual wage of miners in Great Britain was from \$7.00 to \$9.00 per week. I am within the mark when I say that Nova Scotia miners' wages were twenty-five to forty per cent. better. But lest I might raise a dispute, I will modify the assertion as to wages by adding after the words "better paid," "and harder worked," for the Nova Scotia miner is a hard worker. The British miners who recently came this way will attest to this. I could make comparisons, but that might displease some who have recently come among us. But if he is hard working, then, judging by the appearance of the average Nova Scotia miner, hard work agrees with him.

If the Nova Scotia coal miner of sixty years ago was only bearable, then a change truly has come, for he of to-day invites respect."

Since Mr. Drummond left the P. W. A. there have been more than one authorized strike at Springhill, a costly but unsuccessful strike at the Sydney Steel Works, during which the employers appealed to the Government for military protection, and an unauthorized strike at Port Hood; and the career of the Associa-

\*tion has been affected by the workmen brought in from Great Britain and other districts during the recent industrial expansion of Cape Breton.

The effect of this labor immigration upon the Nova Scotian coal industry cannot be foreseen; it has already disturbed the reliable order of Trades Unionism established at the collieries; under the circumstances described above; but the existing and pending laws for the amicable arbitration of labor disputes should prove an equi-pose to over-aggressive trades unionism. To this may be added the pacific influences likely to be exerted by the hereditary intelligence of the Nova Scotian mining classes, and the fair treatment the mine workers enjoy from the operators. Trades unionists at the Nova Scotian collieries, can satisfy themselves by a perusal of the analysis of the profits of coalmining in Nova Scotia since A. D. 1826, published in this work, that the capitalists who employ them have supported our collieries and now finance them without deriving any undue advantage from the labors of the Nova Scotian miner.

The mine workers of Nova Scotia have, in the past, by their moderation, patience and good judgment, promoted the development of the Nova Scotian coal trade; and by the exercise of similar good judgment they can further promote this great industry.

\*Under the administration of Mr. John Moffat, Mr. Drummond's successor, during whose regime the condition of the mine workers has further improved: Vide Mr. Moffat's summary of progress, *Halifax Chronicle*, August 23rd, 1909.



## CHAPTER XVI.

The introduction of the English custom of paying miners wages in goods into Nova Scotia, can be traced about A. D. 1809, to the Crown Mines Agent at Sydney Mines, who was allowed to supply the colliers with food and other articles at a personal profit of £225 per annum. From that time to the entry of the General Mining Association of London, England, into Nova Scotia. A. D. 1827, the Truck System appears to have prevailed; and, perhaps as a rule, the colliers received their wages, principally in goods and liquors. The Mining Association abandoned the Truck System, about A. D. 1831, and did not re-open a mine store untill 1878-9. After A. D. 1858 their competitors established the system at the outmines of the Sydney Coalfield, where it proved useful in financing the mines, especially over the depressions, after the abrogation of the Reciprocity Treaty in A. D. 1866. The winters and ice-infested Springs then cut off the revenues of the Cape Breton collieries for months; and the necessity of banking coal for shipment at the opening of navigation, imposed peculiar burdens upon the less wealthy coal operators, who doubtless found it more convenient, as well as profitable, to defray their principal expenses i e the cost of labour during those months, by paying wages in goods. There can be little doubt that abuses penetrated into the system; that it, to some extent placed a premium on idleness; and that industrious men were at times denied work during the "slack" seasons, in order that less thrifty operatives, who had incurred debts in the colliery store, might liquidate them without delay.

The Commissioners appointed by the Federal Government to investigate the relations between capital and labor in A. D. 1888, reported that the employers contended they kept these stores solely for the accommodation of the workmen, who were there

furnished goods as cheaply as at outside shops; but the manager of one of the mining company's stores in Cape Breton admitted to the Commission that the goods could be supplied at cheaper prices. The Commissioners found, that on pay days workmen dealing at the "company stores" often discovered the balance against them; that the system induced careless, extravagant and dependent habits; that its ill consequences extended to the agricultural classes, who were often obliged to accept payment for their produce in goods; that it enabled the employers to make a double or more than a double profit out of the labor of their workmen and gave them the use of money belonging in all fairness to the men; and they earnestly recommended the abolition of the system by legislation.

The Truck System continued, however, to be a recognized branch of the Cape Breton coal trade; the Dominion Coal Company extended the "mine stores" and opened a "store at the new Dominion No. 1 Colliery, in spite of a feeling among the operatives that the Truck System should not be established there. The Company doubtless felt the advantage of paying wages in goods instead of in money, during its large initial expenditures, and after its failure to secure free access for its coal into New England; and it thus profited, like its predecessors, during a difficult period in the coal industry, by the existing system of the payment of wages in goods. Their elaborate development of the Truck System was, however, considered prejudicial to the interests of the country; and, if unchecked, seemed to threaten to deprive the province of some of that prosperity, the expectation of which had induced the Nova Scotian Legislature to re-establish, in a measure, the monopolistic tendencies it had persistently combatted against the General Mining Association (A. D. 1858.) In March, A. D., 1895, the Hon. Robert Drummond in his place in the Legislature, stigmatised the company's mine stores as a premium upon beggary; and Mr. Murray, the present Premier of Nova Scotia, acknowledged that the Government considered them liable

to disturb the existing relations between capital and labor. The Author led a public protest against the system; and in twelve Canadian journals, upon public platforms in Cape Breton, and by public petitions to the local Government, he initiated a movement for the compulsory payment of wages in current coin of the realm only. This movement was condemned by opponents interested in the preservation of the Truck System; but his appeal for the payment of wages in Canadian currency only was ultimately approved by the mining, agricultural and mercantile classes. Delegates from the Workmen's Association testified that the "Truck System" forced workmen to exchange their labor for domestic supplies; and declared that all wages should be paid in cash. Miners, merchants and consumers approached the Nova Scotia Executive for legislation to make that compulsory; and the local press editorially condemned the Truck System. The public meetings addressed by the Author urged the Nova Scotian Government to pass legislation for the compulsory payment of all wages in current coin of the realm; and his petitions to that body for relief were extensively signed. The payment of wages in Canadian currency only consequently became a prominent public issue; the members elected to represent Cape Breton County at the election of A. D. 1897, adopted the sound, economic principle that the wages of mine workers should be paid only in current coin of the realm; and on June 30, 1898, a deputation from the Church of England Synod, headed by the Bishop of Nova Scotia, urged the Nova Scotia Government to abolish or mitigate the evil of the Truck System.

Early in 1899 the Legislature responded by passing an Act entitled, "An Act for the Further Protection of Miners." The principal provisions of the Act were:

"No employer of labor engaged in coal mining, shall, after May 1, 1900, pay any wages otherwise than in the currency of Canada.



"Provided, however, that any employee may, if he so desires, give an order authorizing his employer to apply the whole or any part of the wages due to him for any one fortnight, to the payment of any legitimate debt, owing by said employee; but such order shall only be effectual for the fortnight specified therein.

"Provided also, that any such employer of labor may retain out of the wages due an employee, not more than ten per cent. of the wages due such employee on any pay day, in payment of any legitimate debt, due such company, if the same was contracted before the passing of this Act."

Any such employer of labor who shall violate any of the provisions of this Act, or who shall retain any wages due any of their employees save as in this Act provided shall, for each violation be liable to a penalty of not less than fifty (50) dollars, and not greater than one hundred (100) dollars. The said penalty may be sued for and recovered by any person in a summary manner."

The burden of proving the strict observance of this Act, from which the stoppage of wages for the payment of powder, coal, rent, church and society dues, checkweighmen and doctors was excepted, was placed upon the employer; and the penalties for a breach of it were assigned to the aggrieved person. The latter were, however, made payable, to the Crown by a subsequent amendment.

## CHAPTER XVII.

The co-operation of the mining classes in Nova Scotia for the management of industrial interests created by themselves out of their own savings, is a desirable arrangement, calculated to increase their wealth and to familiarize them with the peculiar responsibilities of the (so-called) capitalist class. Here, as in Great Britain, the co-operation usually takes the form of co-operatives stores to supply the wants of the workmen's families. Like the existing trades unionism at the collieries, the co-operative store system was introduced into Nova Scotia from the British Isles. The British co-operative movement apparently acquired vitality at the foundation of the Rochdale Society of Equitable Pioneers in A. D. 1844; but prior to that year, there had been instances of co-operative industry among English miners, New England fishermen, and the Greek sailors of the Levant; and it is even asserted that the co-operative idea was in operation at Govan, Scotland, as early as A. D. 1777. It is, however, generally agreed that the co-operative movement took a permanent form with the Rochdale Pioneers in 1844. That society was founded by twenty-eight weavers, nearly all of whom were Socialists, who raised with great difficulty the sum of £28 (about \$140.00) by weekly subscriptions of four to six cents; and opened a store to supply themselves with flour, butter, sugar and oatmeal. They limited the interest on their shares to 5 per cent. dividing profits among members in proportion to their purchases; and by 1857 the membership had increased to 1850, their capital to £15,000, and their annual sales to £80,000. The movement spread over the country, doubtless to the general benefit of the working classes, and it was (it is claimed) introduced into Cape Breton about forty years ago. A store, apparently the earliest in Nova Scotia, it is said

paid dividends of 12, 13 and even 17 per cent., but after some years it went into bankruptcy inflicting loss upon the small investors who had established the enterprise. Another small Co-operative Store subsequently formed at a coal mine also failed; two companies formed at Cow Bay (Morien), went out of existence in 1893 and 1894; and another Co-operative Store offered its creditors fifty cents upon the dollar.

From the evidence of the State papers of Canada, in relation to Springhill, inserted elsewhere, it appears that in 1888 the workmen at that important colliery, after experience with two, then extinct, co-operative stores, had become opposed to co-operative stores. The State papers also contain the following evidence of a miner at Little Glace Bay, Cape Breton :

"Is interested in co-operative store established about three years ago, and having at present a capital of about \$5,000, in shares held by eighty or ninety persons, most of whom are miners. Dividends of 22, 12, 14 and 16 per cent. have been declared and added to the capital half yearly. Shares cost \$5 in cash, and members can get goods on credit up to \$4 a share. Non-members have to pay cash. Original amount invested was \$950. Directors, president, treasurer and secretary elected by stockholders. Directors buy goods and hire salesmen, etc; and a co-operative store-keeper at Sydney Mines testified as follows :

"Stock owned by miners themselves, and has been in operation twenty-one years. Sells at same price as other stores; profit at times very good, gives credit to amount of investment; outsiders pay cash; capital limited to \$40,000; \$10 smallest amount received. Knows of a few men in mines who have saved money. Agent for Dominion Savings Bank since 1883; total deposits with him now about \$70,000; does not know proportion belonging to miners; farmers are principal depositors."

There are now in existence, upon a favorable commercial basis, six workmen's co-operative stores, in the Pictou, Inverness and Sydney coalfields. The total authorized capital of these en-



terprises is fully \$162,000, divided into \$5.00 shares. Of these the Union Association of Stellarton, N. S., incorporated in A.D. 1865, may be regarded as an illustration of successful co-operative storekeeping by workmen, through the severest vicissitudes of the Nova Scotia coal industry. There is in addition a French Co-operative Store, at Glace Bay, supported by the French workmen, in that district. It is stated that, one of the Co-operative Stores, in the Glace Bay Basin of the Sydney Coalfield, has earned during the past six years net profits amounting to \$29,000, of which \$19,769 has been paid to its members.

## CHAPTER XVIII.

The mining and manufacturing of iron is one of the chief labor providers and wealth distributors of modern times; and its important influence upon the economic progress of nations so markedly resembles that of coal mining, that the two industries are justly styled the basis of modern civilization. States fortunate enough to possess coal, iron and fluxes in such convenient juxtapositions, near the principal trade routes of the world, like Nova Scotia, usually energetically press their joint development; and upon the intelligent combination of their coal and iron resources rise their numerous lucrative industries.

The strategic position of Nova Scotia for the manufacture of iron and steel, often noticed, has been pointed out by an American ironmaster, as recently at A. D. 1901. The cheapest steel centres in the world are, by this authority, stated to be in the United States, in the Middlesboro district of England, and in Germany; but he considered that steel can be manufactured cheaper in Nova Scotia than in any of those districts.

The development of the Iron fields of Nova Scotia though attempted very early in the nineteenth century, does not, however, progress satisfactorily, latterly, doubtless, owing to the competition of imported foreign ore.

So long ago as A. D. 1835, Dr. Gesner, the prime agitator against the Mining Association's coal monopoly, deplored the anomaly that the country imported iron, while the hills were known to contain accessible native ores.

The Geological Survey of Canada has since borne testimony to the excellent quality of some of the Nova Scotian ores; and Sir William Fairbairn, author of "Iron, Its History, Properties and Processes of Manufacture," is authority for the statement that

the very best quality iron has been manufactured from our native ore.

Iron or indications of iron ore are found in fifteen of the eighteen counties of the Province; some of these fields, particularly those holding bedded hematites and magnetite, are valuable,\* and taken as a whole our deposits contain at a moderate estimate, very many million tons of available iron ore. The most important, i e., the bedded ores referred to above, lie at or near the horizon of, and have been deposited under conditions similar to the Bell Island, Conception Bay, Newfoundland, ironfields, from which the Nova Scotian ironmasters draw their ore supplies.

The following table is believed to represent the Nova Scotian ores indigenous to various geological horizons.

Geological Age	Variety of Ore Found.
Modern.	Bog Ore—Iron Sand
Triassic { Sandstone	} Magnetic, Specular
{ Trap	
Permo Carboniferous	Clay Ironstone
Upper Coal Measures	“ “
True “	Black Band, Clay Ironstone
Lower Carboniferous	} Clay Ironstone, Spathic
	} Limonite, Red Hematite
Devonian	} Hematite, Limonite, Spathic
	} Ore, Specular, “Paint” Ore
Silurian	Red Hematite, Magnetite

Ore is also said to be in pre Silurian formations.

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As the gold bearing formation of the Province, in which iron ores, apparently of no economic value, have been discovered, and their associated granites occupy much of the Atlantic coast of the Nova Scotian mainland, the principle known iron fields are confined largely to the more northern districts, in Annapolis,

\*These lie in the Silurian series, which, in the Appalachian division of the United States\* of which Nova Scotia is the extension (vide p. 7) holds a wide distribution of similar bedded iron ore, normally persistent in depth and strike.



Kings, Colchester, Pictou and Antigonish. Guysboro, and the contiguous island of Cape Breton are also ore bearing. These fields should, like those of similar countries, be classified as (1) vein, pocket, and surface ores, mainly, only suitable for furnace mixings and (2) metallurgically more basic bedded ore. The lack of this classification and the depression of our iron mining industry by the competition of foreign ore, has obscured the existence in Annapolis, Pictou, Antigonish and Cape Breton of the extension of the appalachian iron field exposed in the neighboring United States and on Bell Isle, Newfoundland, and extensively paralleled by minor deposits for admixture with its ores.\*

Irregular veins of magnetite ore and some specular, sometimes so minutely disseminated that it can be recognized only when separated by the magnet, occupy the Triassic Trap, on the coast of Digby, Annapolis and Kings Counties; the magnetite often pure, frequently massive, sometimes crystallized in partly filled veins and associated with quartz, colorless and amethystine. The soil derived from the ores sometimes holds limonite as the result of a secondary process. At Digby a deposit varies from 18" to 2' 0" in width; the deposits examined at Granville, Margaretville and Malvern are possibly workable; and small quantities of superior quality lie at Middleton. Red Hematite occurs similarly associated with quartz, agate and calcite, sometimes, as small crystalline plates, in a granular quartz matrix, and sometimes as crystals, apparently revealing its derivation from the magnetite. The more highly crystalline specimens exhibit magnetic properties.

†A Silurian Basin 12 miles long by about 3 wide maximum extending N.E. and S.W. between Bear River and Clementsport, and coeval with the Torbrook-Nictaux iron field further east, holds iron ore, which has been opened at several points as follows:

\*The similarity of the lenticularly bedded Annapolis and Pictou ores, the "shell ore" of the former being possibly one of the "Blanchard" ores of the latter; the indications of the passage of the Pictou into the Antigonish ironfield, a similarity of ores in both districts, also the resemblance between the ore and its distribution in the beds all along the and between the containing rock at both ends of the Annapolis-Antigonish iron range, is such, that, for these and other reasons, the Author regards the Annapolis-Pictou-Antigonish iron deposits as sections of the same. Acadian Appalachian Ironfield, protruded through the overlying sediments.

†The possible iron range in this basin is estimated at 4 miles.

MILNER PITS (2)—These openings—35 feet apart—are surface excavations, in the aggregate, 800 feet long. The ore, the strike of which is N 70°-E Magnetic, said to be metamorphosed with some magnetic properties and imprinted with casts of relibite, spirifers and associated mollusks, is said to have yielded about 33 per cent. of metallic iron.

POTTER PIT—A surface excavation 390 feet long, 630 feet south of the range of the Milner Pits. The magnetite ore in this pit, the strike of which is N 75° E., Magnetic dip 75-80° S.E., resembles ore at the western end of the Torbrook-Nictaux Field, especially part of the South Mountain ore.

	Ft.	In.
Reported Section, Ore .....	3	...
Slate .....	2	6
Ore .....	3	6

This ore has also been reported 2' 6" thick and is said to have yielded as high as 45 to 48 per cent. of pig iron. The ore wrought in these openings, is a stable or persistent type of iron deposit.\* The mineral is said to cross Deep Brook; and, as its structural horizon appears continuous, it may be found for miles east and †west of the known exposures. Further east a less clearly defined iron field doubtless the logical extension of the Bear River—Clementsport Field lies between Paradise River and a spur of the southern granitic mass; and still further eastward 500,000 tons of magnetic ore in veins 3'—10' thick, are said to be above water level in the Silurian series, at Cleveland (West Nictaux. This field, and its eastward extension, to the richness of which the State Assayer of Massachusetts, U. S. A. drew attention as early as A. D. 1855, apparently affected by faults along Nictaux River, extends eastward of that stream, certainly to a point between Saunders' Brook and Fales river, in Kings County; presumably a sharp, narrow, rather disturbed Silurian syncline, perhaps with subordinate folds,

\*Its regular distribution in the bed is not yet established.

†The Silurian i. e. ore bearing series is interrupted by granite about 2 miles N E of the Potter Mine.

holding inter-stratified, characteristically rolling typically stable or \*persistent beds of non-fossiliferous and fossiliferous or "shell" magnetite ores, which alter to similar varieties of hematites on their strike. Every gradation in the transition of magnetite into fossiliferous hematite, from strongly magnetic ore with a dark brown streak, to normal non-magnetic hematite with a red streak, may be observed in the district; and the existence of fully 300,000,000 tons of ore is said to have been computed from the prospecting operations carried on in recent years. Owing to the "shell ore" comprising magnetic and non-magnetic laminae, the former of which (by one analysis) carries considerably more iron than the latter, the magnetic character of some of the "shell ore" contrasts strongly with the inertness of other pieces apparently of similar composition. The "shell ore" fossils noticed include varieties of *Spirifer*, *Strophomena*, *Atrypa*, *Avicula* and *Bellerophon*. These ores, believed to be suitable for the Basic, and, in some cases, for the Bessemer processes, can probably be mined and shipped at Annapolis for \$1.10 per ton and their extraction might be facilitated by utilizing the power of Nictaux River, the minimum flow of which is said to be 7680 cubic feet per minute, with a fall of 70' in 3750'.

### PARTIAL DESCENDING SECTION OF ORE BEDS.

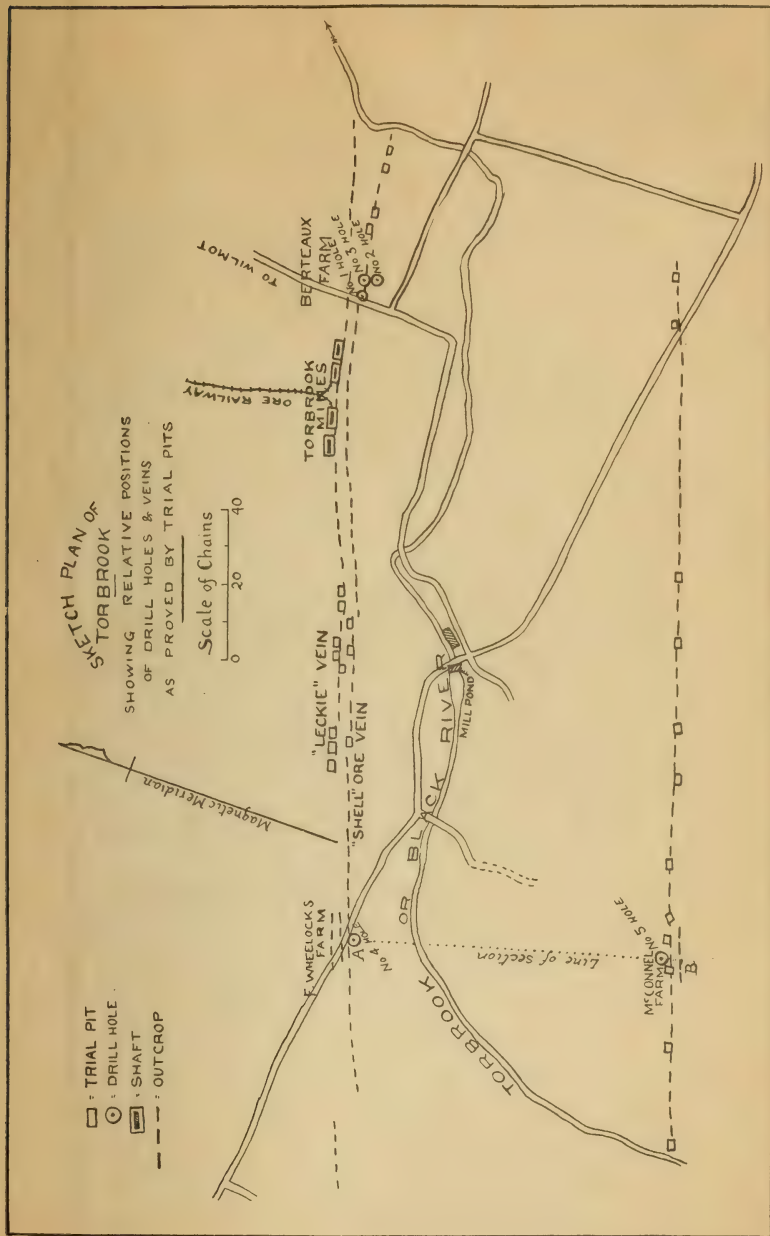
#### IN THE EASTERN DIVISION OF THE NICTAUX-TORBROOK FIELD.

NORTH SIDE OF BASIN.			SOUTH SIDE OF BASIN.		
Name of Bed.	Thickness.		Assumed Equivalent.	Name of Bed.	Thickness
	Ft.	In.			Ft. In.
"Shell Vein.....	5	...	Assumed Equivalent.	.....	.. ..
Strata.....	80	...		.....	.. ..
"Leckie Vein".....	6	...		"South Mountain".....	5 ..
Strata.....	40	...	" "	.....	.. ..
"Lean Vein".....	3	9		"Messenger".....	4 2

\*Relatively non-fossiliferous.

†The ore is (where worked) irregularly distributed in the beds and in this and other respects presents some interesting points of resemblance to the hematite worked in the Lower Silurian, Skiddaw Slates in Great Britain the local strata is also similar to the Skiddaw series.



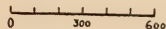


Plan showing position of North and South sides of the "Torbrook-Annapolis" Iron Field, by D. Weatherbe, C. E.  
(Reproduced by permission from Transactions Nova Scotia Institute of Science, A. D. 1901, Plate VI, Vol. 10).



Cross-Sectional View on A B (Plate VI)  
(looking west)

~ Scale of Feet ~



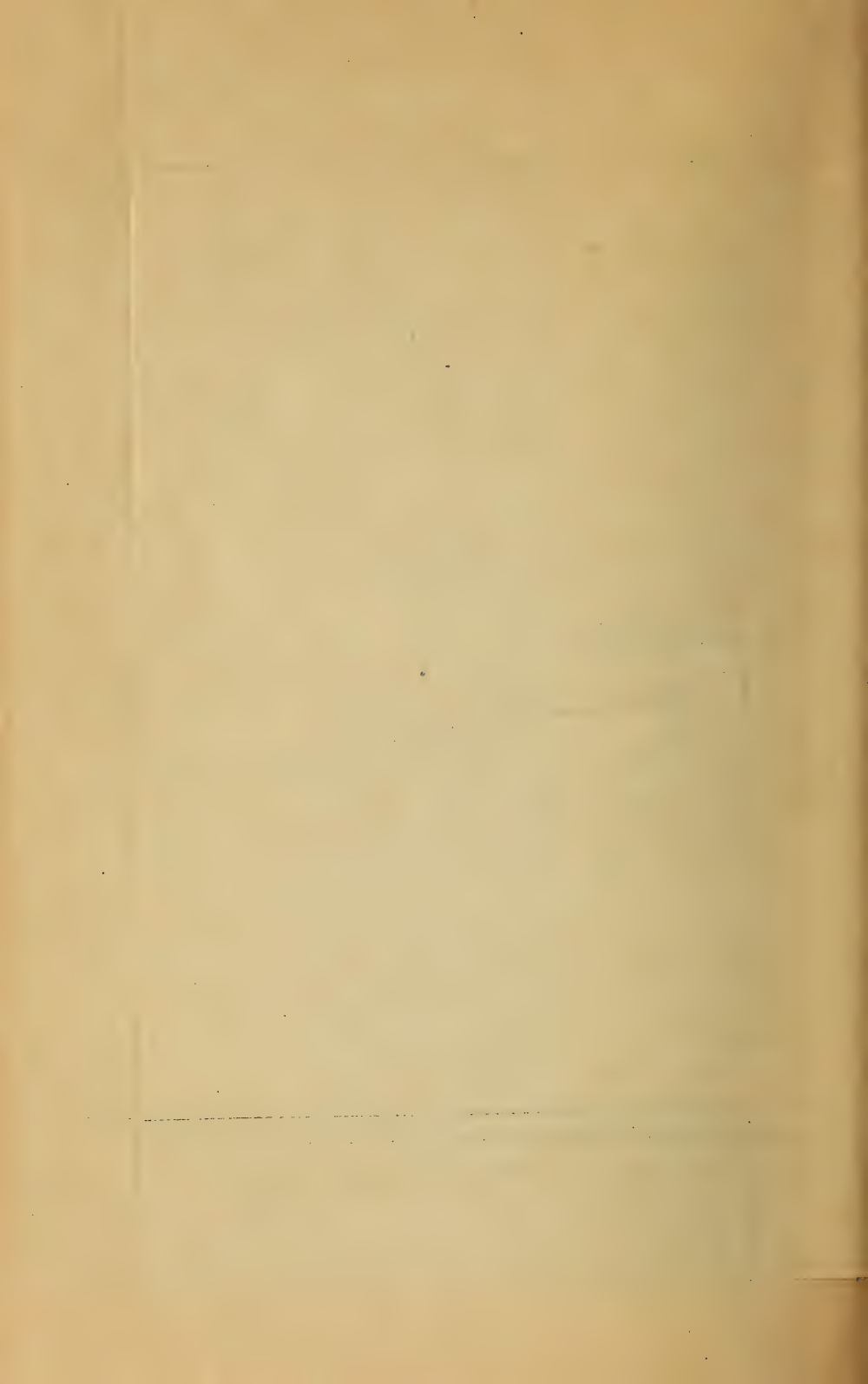
No. 5 Hole  
McConnell's Farm

No. 4 Hole  
F. Wheelock's Farm.

TORBROOK  
BLACK RIVER

1. VI. 01.





The "South Mountain" and "Messenger" beds are assumed to be separate deposits; the former is associated with light green slates, like those observed on the wall of its assumed equivalent—the "Leckie Bed," but its quality is apparently not up to the standard of the "Leckie," perhaps owing to its proximity to the granite; the "Messenger bed is divided by a slate band like its supposed equivalent, the "Lean Bed" and the light green and fawn colored slates over and underlying it are similar to those near the "Lean" bed.

A characteristic bed of quartzite underlying the northern ore beds reappears in places below the southern beds.

The "Leckie" bed, which compares favorably in its iron contents with the lower of the celebrated Bell Island, Newfoundland ore beds has pinched out, in working at a shallow depth, on the east, and deeper on the west; but an horizontal bore hole, on the east, has proved that ore (where cut) lower grade, occupies a considerable breadth below the pinch, and the ore has been recovered on the west by a cross cut from the overlying shell vein.

The Leckie Vein rarely marked with shell fossils on the east holds more increasingly west as the ore becomes more magnetic. The synclinal field apparently dips generally N. E. perhaps affected by transverse folds or faults from the local highlands, and, as stated elsewhere, conceivably extends under the more recent formations, lying in that direction, to the ore bearing series of Pictou-Antigonish.\*

For section of a bore hole sunk to a depth of 1496 feet within the Kings County line, near the Estuary of the Avon, and plan showing the location of this bore, in relation to various geological formations, vide N. S. Mines Report, 1902, p. 77-8 and 1903, p. 79.

Early in the XIXth Century the Nova Scotian iron industry began in this important district, in the manufacture of bar iron in a Catalan forge at Nictaux. These crude smelters, which derived their name from the Spanish province of Catalonia, where they were formerly much used, consisted of a rectangular hearth, constructed chiefly of heavy iron plates about 40x32 inches and

\*Vide Footnote p. 228.

24 to 27 inches deep, and consumed about  $9\frac{1}{2}$  cwts. of ore and  $10\frac{1}{2}$  cwts. of charcoal per 3 cwts. of bar iron produced. The blast pressure did not exceed  $1\frac{1}{2}$  or  $1\frac{3}{4}$  inches of mercury. Smelting was carried on with many precautions for the regulation of the blast, stirring, and the addition of ore which had passed through a four-tenths of an inch bar screen, and coal; and, at the end of six hours, an agglomerated mass of reduced but unmelted iron was drawn from the bottom of the furnace to be forged into blooms or bars. In A. D. 1825 the Annapolis Iron Mining Company, Limited, formed by provincial capitalists, supported by two public bonuses of £600 each, prepared to smelt the local and Nictaux ores on a more extensive scale, at Clementsport, Annapolis Basin. The capital originally fixed at £10,000 divided into one hundred, £100 shares was later increased to more than twice that amount and £30,000, currency, was expended in acquiring ore properties about  $3\frac{1}{2}$  miles from Clementsport, at Nictaux and other places, in damming the Moose River, erecting a stone blast furnace 35' high x 4' dia. at the hearth, in building a casting furnace surface buildings and in carrying on the enterprise. The local ore was mixed with Nictaux ore, presumably from an opening on a "shell vein," in Abel Wheelock's orchard; and the iron manufactured, was cast into kettles, stoves and some bar iron; but as the furnaces could only be made to produce 13 tons of pig iron per week, i. e., less than one-third the yield of the competing British furnaces using nearly the same percentage ore, the enterprise was abandoned. Bangor, Maine, U. S. A., iron-masters relit the furnaces about thirty years later, and, in 1862, produced five tons of pig per day. In 1872, again blown in, it produced 163 tons of pig iron from 600 tons of Potter mine ore for the Boston market; the following year, the inferior white pig smelted from that ore was improved by the admixture of an equal weight of Bloomfield bog ore, carrying about 26 per cent. of metal. Flux was imported from St. John, N. B., and charcoal



from the white birch was used in the proportion of about 130 Winchester Bushels per ton of pig produced. The charge, which was repeated from 40—52 times per 24 hours, consisted of 750—800 pounds of ore, 120 pounds of limestone and sixteen bushels of charcoal; and 630 tons of ore yielded 180 tons of pig iron during 1873. Probably 20 tons more pig was smelted in the following January, but after that month merely a little ore mining appears to have been carried on. Two charcoal blast furnaces—35' high x 9' dia. at the boshes and 4½' at the throat, and 38' high x 9' dia. at the boshes, were erected at Nictaux about A. D. 1856 by the (English) Acadian Iron Mining Association; and the smelting of the "shell vein," with an admixture of bog ore, was resumed. Limestone was imported through Port George, ten miles distant, and the pig iron product was exported from the same point. The quality is said to have been inferior, perhaps owing to the phosphorus in the ore; and, after the manufacture of about 6,000 tons, both furnaces were abandoned. Four shafts were sunk upon a 6'6", interstratified bed of red hematite, some three miles further east, by "The Torbrook Mining Company," in 1891, and ore was exported to Londonderry, N. S., via the Dominion Atlantic Railway also to the Ferrona (East River, N. S.,) furnace, to be mixed in about equal proportions, with Colchester and Pictou ore. The Ferrona ironmasters found the ore readily reducible and, mixed with a low phosphorus, brown hematite, ore, from the East River of Pictou, averaging 42—45 per cent. of iron in the furnace, it is said to have made excellent foundry iron. The largest proportion of Annapolis ore smelted with East River ore was treated at Ferrona between May 8th and 23rd, 1896, with the following results:—

## Furnace Charge:

Lbs.

3,773,650 Coke

1,658,650 Limestone

1,889,300 Brown hematite (East River)

1,889,300 Red hematite (Torbrook)

## Furnace Produce:

1,846,000 lbs. of Pig Iron=923 tons, analyzing:

## Approximate Analysis of pig:

Metalic Iron.....	92.5	p. c.
Carbon .....	3.0	"
Silica .....	2.5	'
Manganese and Sulphur .....	2.0	"
	<hr/>	
	100.0	"

This development of Nova Scotian iron mining was, however, checked by importations of foreign ore. Early in 1896 the Commissioner of Mines informed the Provincial Legislature that the Ferrona ironmasters expected to replace the Torbrook ore, at this furnace, with a similar ore from their own mines, on Bell Island, Conception Bay, Newfoundland.

This substitution of foreign for native ore was carried into effect; and the most important Nova Scotian iron mines was necessarily closed in 1896 for lack of markets. The Londonderry Iron Company re-opened the mine in 1903; and mining operations are now carried on by their successors—The Canada Iron Corporation, at a point two miles further west (East Mines,) upon an overlying bed of brown shell, magnetite ore, varying from 6' on the regular dip to 18' on the rolls. The new mine has, however, been connected by a cross-cut with the earlier wrought underlying seam, also by rail with the West mine, ("Shell Vein,") about a quarter of a mile further west; and all the works are connected with the Dominion Atlantic Railway. About 5,000 acres of iron lands, (not subject to government royalties,) approximately 5

miles long by  $1\frac{1}{2}$  wide, between Nictaux River and the Annapolis-Kings line, are now owned by the Iron Corporation; and the works have a present capacity of about 300 tons per day. The production of ore at the old Torbrook and at the East and West Mines, (inclusive of 1735 tons raised during prospecting operations) is reported to have been:—

	Tons.	Labor Employed.
1891 .....	10,000 .....	—
2 .....	18,000 .....	101
3 .....	30,000 .....	86
4 .....	21,590 .....	67
5 .....	30,073 .....	70
6 .....	19,944 .....	43
1903 .....	5,000 .....	37
4 .....	— .....	—
5 .....	14,538 .....	—
6 .....	27,000 .....	65
7 .....	29,085 .....	79
8 .....	19,712 .....	—

The cost of mining and delivering the ore at the Londonderry Furnaces is said to be \$1.90 per ton of 2240 lbs.

**Bog Ores.**—The mixture of equal parts of grey magnetic and Bloomfield bog iron ores at the Clementsport furnace of the Annapolis Iron Co. in 1874, invests the bog ore upon the lower terraces of the Annapolis River and its tributaries in the Nictaux district with some economic importance. The deposits lie, near the alluvial sediments, in patches up to at least two acres in area, nowhere, however, so far as noticed, more than 3' thick, over a distance of 10 to 12 miles and are said to contain as high as 47 per cent. of metallic iron.

The eastward extension of the Nictaux-Annapolis field, along Minas Channel-Basin has not been ascertained; but it conceivably extends under the more recent rock of that district, into the ore bearing series of Pictou and Antigonish.

Irregular veins and chambers of excellent limonite ore, some almost chemically pure, analysing, averages less favorable:



Water.....	11.36
Silica and gangue .....	1.54
Sulphuric Acid.....	Trace
Phosphoric Acid.....	"
Magnesia .....	"
Peroxide of iron with very little Alumina..	87.10
Metallic Iron.....	60.00

varying from 18—30 feet wide, has been found at Brookfield near\* Truro, (Colchester County); in at least one instance, directly replacing a limestone bed, within a short, varying distance of the contact of the Carboniferous limestone with rocks, said to be identical with those that hold the more northerly Londonderry ores. The veins apparently follow a specific series of beds, east and west, and they will perhaps be found over the several miles of country, in which drift ore has been observed, to the east. About 15 miles eastward excellent red hematite, analysing:—48.50 to 48.63 Metallic Iron; Sulphur, .15 to .16; Phosphorus, .01; Silica, 22.70 to 22.75, lies at the base of the Lower Carboniferous, at Newton Mills, Stewiacke River. This ore, finely brecciated, is associated with a reddish and grey impure limestone containing shells, underlies, at many points, a red calcareous conglomerate, containing pebbles of whin and other rocks, and, in places, penetrates into and reddens the joints of the underlying slates, which are, in places, rich enough to work as ore. These deposits have been drawn upon by the Nova Scotian ironmasters as follows:

	Newton Mills.	Brookfield.
	Tons.	Tons.
1888 .....	.....	1000
1889 .....	400 .....	1732
1890 .....	....	1520
1902 .....	.....	15214
1907 .....	.....	3406

The above figures although from official sources are perhaps incomplete; more than 44,400 tons of limonite are said to have been mined at Brookfield.

\*A "Devonian Ore" for the relative economic importance of this class of ore, vide next page.

An iron bearing formation, in which costly efforts have been made to establish the Nova Scotian iron and steel industry, extends along the opposite side of Minas Basin, on the south slope of the Cobequid Mountains, from the Truro-Tatamagouche Road \*to Harrington River, and, apparently, almost to the extremity of Cape Chignecto. The field varies up to 200 feet in width, and contains specular and limonite, as well as ankerite suitable for simultaneous fluxing and smelting. The ore bearing rock belt is greyish and brownish grey quartzites, grey and brown shales etc., extensively paralleled on the south by a belt of black graphitic shale; it is well exposed upon streams flowing into the Bay.

The "Londonderry" division of the field was reported upon for London, Eng. capitalists in 1849, by J. L. Hayes, of Portsmouth, U. S. A., who considered, that first quality iron could be manufactured on the banks of the Great Village River; and six Catalan forges, a puddling furnace, a heating furnace, one hollow fire, a metal helve and one blower, with ore crushing rolls driven by two overshot waterwheels, were erected in 1850. Mines were opened on the western bank of the Great Village River, where the ore, apparently increasing in width to at least 120' and dipping S. consisted of a complicated vein of crystalline carbonates of lime, iron and magnesia, called Ankerite, associated with sulphate of barytes and a variety of spathose ore or sparry carbonate of iron, which surrounded and enclosed:—

Specular Iron Ore.

Magnetic Iron Ore.

Red Ochrey Iron Ore.

Yellow Ochrey Iron Ore.

Brown hematite.

The appearance of this vein, between its broken walls, interrupted by included rocky fragments and affected by numerous transverse fissures was irregular, complicated and confusedly intermixed; the ankerite veins varying from one tenth of an inch

\*A Devonian ore deposit similar to that in the "Middle Devonian," West Somerset, Great Britain. Like the latter, it has proved to be, (taken alone) an unsatisfactory basis for an iron industry. This probably applies to all similar deposits in Nova Scotia.

†The Limonite (usually on the surface) varies from hard to ochreous (paint ore).

to about 50 feet thick; the red ochrey iron, dispersed in the ankerite in veins sometimes two yards thick and irregular masses often much thicker; the specular ore distributed in small irregular veins and in disseminated crystals and nests; and the magnetic ore in one place mixed with the specular. The deposit is said to have been always found 300 yards to a third of a mile, northward of the last of the Carboniferous series for at least 7 miles; but it is said to have been traced considerably further, varying in the thickness, character and richness of the ores. Little or no brown or black ores were found in the bottom of the ravines traversed by the local streams, a phenomenon accounted for by the fact that, in the first workings, limonite at the surface changed to the deep \*into ankerite and siderite, sometimes with much carbonate of lime. From Great Village River the vein was worked eastward by levels at, and near Campbell's Brook; by open trenches, east of Folly River, for the extraction of red ochre used in the manufacture of paint; 100 yards further east by open cut on a width of 15—18 feet, from which at least 600 tons of 1st quality limonite in large and small concretionary masses was raised in 1864; and further east by a shaft from which large masses of ankerite and specular ore, with some limonite, were taken. The further extension of the vein was traced by surface indications to Pine Brook; eastward it showed ankerite and spathose ore; and further east it was traced, from the north side of a tributary of Totten's Brook, for a quarter of a mile along the hills, thence for fully 210 feet, varying from 4'6" to at least 18 feet thick. In the Totten Brook district the vein contained brown and whitish ankerite holding films and blotches of specular iron ore and vuggs in which plates of barytes have been noticed. Light green, rather soapy argillites, showing films of specular iron ore have been observed on the footwall, a reddish, flinty argillite on the hanging wall, and on both walls, as well as in the vein itself, a large quantity of yellow paint or ocherous ore.

\*This is also a feature of the workings in the kindred British ore referred to on preceding page.



The ore smelted up to 1857 was mined between Great Village River and Cook's Brook; the vein, traced by surface openings to within 180 yards of the latter, and opened by a level close to the west bank on the direct strike from Great Village River, in mixed specular, red ochre and ankerite ores averaging 3-4 feet thick, was next found S. W. of Martin's Brook, and was more or less mined to within 150 yards of the Cumberland Road. The district S. W. of Martin's Brook exclusively supplied the smelter between 1858 and 1872-3, excepting 2959 tons, from mines on the west side of Cumberland Brook. The crop workings extended in shallow pits and open cuts for 3953 feet in good ore and the main for 740 feet on the eastern end of the vein to a depth of 200 feet below the surface in rich, abundant ore, averaging 3-4 feet thick. The vein was lost about 150 yards from the Cumberland Brook and recovered about 300 yards beyond, 150 feet west of the Brook where it was worked for about 250 yards towards the west, on a reported average width of 15 feet.

A second parallel deposit 4 feet wide called the "Farnen's Hill Vein," discovered 920 yards north of a level driven into Morrison's Hill, underlying about 80 degrees to the southward, was also worked, to a small extent, by shaft and open cut. The Catalan forges were superceded, in 1853, by a firebrick blast furnace 35 feet high x 9 feet and  $4\frac{1}{2}$  feet at the boshes and throat, cased with iron and operated by a cold blast, created by an over-shot, 20 ft. dia. waterwheel; a steam plant superceded the waterwheel three years later; a rolling mill was erected in 1860; and steel works, locally known as the "Pot," consisting of melting and converting furnaces were added to the plant in 1870. The quality of the iron manufactured was admittedly excellent; and, according to Fairbairn, it displayed high powers of resistance to strain, ductility and adaptation to all processes by which the finest description of iron and steel were then made, as well as unusual suitability for the manufacture of ordnance. The following are analyses of the pig, by Tookey, published A. D. 1864:

Carbon .....	3.50	3.27
Silicon .....	.84	.67
Sulphur .....	.02	.01
Phosphorus .....	.19	.28
Manganese .....	.44	.37
Iron .....	94.85	95.70
	<hr/>	<hr/>
	99.84	100.30

The manganese contained an appreciable quantity of cobalt.

The Blast furnace produced 7.13 tons of pig iron per day in August, 1873, on the following monthly charges:

	Tons.	Cwt.	Qr.	Lbs.	Bushels.
Limonite Ore .....	421	6	1	..	.....
Ankerite Flux.....	68	15	2	24	.....
Charcoal .....					32,471
Pig iron produced 221 Tons—7.13 Tons per day.					

The yield of ore in the furnace was, therefore, 52.45 per cent. if the ankerite (which gave about 10 per cent. of iron) is not taken into consideration; otherwise, the ore yield was 50.81 per cent., or about one ton of pig iron per two tons of ore. The plant consisted A. D. 1873, (1) of the Blast furnace, described, at which, (when operated night and day and tapped about once per six hours), the cost of production per ton of pig iron was approximately:

2 tons of ore at \$2.50 .....	\$ 5.00
1/3 Ton of ankerite at \$1.10 .....	.36
147 Bushels of charcoal at 7 1-2c. ....	11.02
Labor and Manager's salary.....	2.80
General expenses, say.....	1.50
	<hr/>
	\$20.68

(2) A forge, where a considerable quantity of wrought iron had been manufactured, containing five puddling and one reheating furnace a 25 cwt steam hammer, rolls and other appliances; (3) a casting house, containing two furnaces with the necessary accessories for the manufactures of car wheels and other castings, and; (4) the steel works, containing a smelting, a converting and three reheating furnaces, two steam hammers and other appliances. The steel was largely used for drilling purposes during the constructing of the Intercolonial Railway, which was diverted from its course to pass near the plant; and, after 1873-4, the future of Londonderry seemed assured, when headed by Dr. Siemens "The Steel Company of Canada," purchased the works for £82,000 in cash and £120,000 in fully paid Founders shares, The Co., expended about \$2,500,000 in erecting new works and in developing a colliery near Maccan, in the Cumberland Coalfield, and acquired at a cost of £8,000, \*the right to use the "Siemen's patents" for the production of iron and steel and its conversion into merchantable form. The "Old Steel Works" were closed and three Siemen's furnaces were built; and in 1875-6 two 600 tons per week coke blast furnaces 63' high, with a blast pressure of 2-4 pounds, heated in Cowper Siemen's stoves, superceded the old charcoal smelter. The following are comparative analysis of the pig smelted in the new furnace and in the charcoal furnace:—

	No. 1 Pig from Coke Furnace.	Pig from Charcoal Furnace.	
Silicon .....	3.621 } Part slag }	.84	.67
Graphitic Carbon.....	3.730	....	....
Combined Carbon .....	.390	....	....
Carbon .....	.....	3.50	3.27
Sulphur .....	.002	.02	.01
Phosphorus .....	.198	.19	.28
Manganese.....	1.126	.44	.37
Iron .....	90.933	94.85	95.70
	100.000	99.84	100.30

\*The "Siemen's" process is stated to have been a failure at this Co's works.



In 1875 the ore on the east and west side of Cook's Brook was opened, also the Folly Mountain ("East Mines") division, then estimated to hold 300,000 tons of ore in sight; and the "West Mines," on Martin's Brook, were connected with the works by rail. Three hundred tons of ore and some of the yellow ochre abundant in parts of the field, were exported by the Steel Co. to the English market in the following year (1876); and, about the same time, "Beehive," ovens, to coke Albion Mines coal, a rolling mill and nine double and single furnaces were erected.

The Bar Iron proved ductile, fine grained, and possessed a tensile strength of 60,000 pounds per square inch, an elongation of 33 per cent, and the following composition

Siemen's Best Bar Iron.	
Silicon.....	.280
Combined carbon .....	.096
Sulphur .....	Trace
Phosphorous .....	.035
Manganese .....	.041
Iron .....	99.548

100.

The "Best Best" iron proved suitable to replace "Lowmoor" and Swedish iron.

Limonite ore was exclusively smelted up to 1884; but during that year the Company smelted some of the spathic ore (carbonate of iron) so abundant at its "West Mines," calcined in local kilns and analysing:

Insoluble, siliceous matter .....	.47
Calcic carbonate .....	.59
Ferrous carbonate .....	69.20
Manganous carbonate .....	1.37
Magnesian carbonate .....	28.73
Ferric Oxide .....	.08

100.44

The "white ore" in the Londonderry iron field may be, in the same vein, siderite, ankerite, dolomite or calcite and has to be carefully selected.

This ore, originally found mixed in strings and veinlets with ankerite, became freer from ankerite as the workings deepened; and was later charged direct into the furnace and partially acted as a flux. Ores were imported from other districts, viz:

A. D. 1880: 497 tons red and brown hematite, from a 7 foot vein at Clifton, Colchester.

A. D. 1881: 255 tons specular ore from veins, 2'—4 1-2' at Boyleston, Guysboro.

A. D. 1887: 172 tons brown hematite from Bridgeville, Pictou.

The hope that "The Steel Company of Canada" would establish on the Great Village River, a Nova Scotian iron and steel industry, similar to those of Great Britain were not, however, realized, and about 1887 the enterprise was reorganized into the Londonderry Iron Company, Limited, of Montreal, which rebuilt and heightened one of the blast furnaces to 75' in 1890-1. The works at that time included 2 blast furnaces, 75' and 62' high, estimated capacity 100 tons per day and 20,000 tons per annum respectively, fitted with blowing engines, hot blast stoves, lifts, ore sheds, etc., of modern pattern.

A Rolling mill, capacity 800 tons per annum.

8 double and 1 single Puddling Furnaces.

Horizontal squeezer and rolls.

18" train of rolls.

16" train of rolls.

9" train of rolls.

2 steam hammers.

5 heating furnaces.

A Pipe Foundry, capacity 6,000 tons per annum.

The wages paid by the Londonderry Iron Company in 1888 were:

#### AT THE ORE MINES.

Miners, average days pay, \$1.62 per nine hours.

Miners, laborers, \$1.07, \$1.15, and \$1.35 per nine hours.

Miners, boys, 30c. and 90c. per nine hour day.

\*Owing, it is said, to the unsatisfactory returns from the steel producers.

Carpenters, \$1.45 and \$1.35 per ten hour day.  
 Blacksmiths, \$1.70 and \$1.35 per ten hour day.  
 Engine Keepers, \$1.25 per twelve hour day.  
 Firemen, \$1.25 and \$1.15 per twelve hours.  
 Timberman, \$1.36 per nine hour day.  
 Landers, \$1.15 to \$1.19 per nine hour day.  
 Pony drivers, \$1.07 per nine hour day.  
 Trackmen, \$1.35 and \$1.07 per ten hour day.  
 Laborers, \$1.07 per ten hour day.

AVERAGE PAY FOR THREE MONTHS, ENDING 31ST. MARCH, 1888.

Wages paid furnace men, etc.

Keepers, \$2.30 per day of 12 hours.

Keepers, helpers, \$1.25 per day of 12 hours.

Slaggers, \$1.32 per day of 12 hours.

Gasmen, \$1.80, per day of 12 hours.

Clay mixer, \$1.38 per day of 12 hours.

Weighers, \$1.46 per day of 12 hours.

Chargers, \$1.24 per day of 12 hours.

Ore fillers, \$1.16 per day of 12 hours.

Coke fillers, \$1.14 per day of 12 hours.

Engine keepers, \$1.63 per day of 12 hours.

Boilermen, \$1.30 per day of 12 hours.

Ore pickers, \$1 per day of 12 hours.

Pig iron lifters, \$1.65 and \$1.25 per day of 12 hours.

Slag removers, \$1.50 and \$1.25 per day of 12 hours.

Average pay for three months ending 31st December, 1887,  
the furnace being stopped in January and February, 1888.

APRIL, 1888. CURRENT RATE OF WAGES PAID AT LONDONDERRY  
IRON WORKS,

Wages paid mechanics, etc:

Pattern makers, \$1.75 per day of 10 hours.

Moulders, \$2.10, \$1.70, and \$1.50 per day of 10 hours.

Blacksmiths, \$2, \$1.50, \$1.25 and \$1.10 per day of 10 hours.



Bricklayers, \$2 per day of 10 hours.

Machinists, \$2, \$1.75, \$1.60, \$1.50 and \$1.25 per day of 10 hours.

Carpenters, \$1.75, \$1.40, \$1.28 and \$1.25 per day of 10 hours.

Locomotive engineer, \$60 and \$55 per month, average day, 10 hours.

Locomotive brakesmen, \$1.50 and \$1.25, average day 10 hours.

Locomotive firemen, \$1.25, average day 10 hours.

Coke oven drawers, \$1.50 per day, piece work.

Coke oven chargers, \$1.65 per day, piece work.

Wages paid mill men :—

Puddlers, \$2.20 per ton ; average day's wages, \$2.50 to \$2.75.

Puddlers, helpers, \$1.10 per ton ; average day's wages \$1.25 to \$1.35.

Puddlers, bar rollers, 17 cents per ton ; average day's pay, \$1.75 to \$2.00.

Puddlers, roughers, 11 cents per ton ; average day's pay, \$1.35 to \$1.50.

Puddlers, catcher, 10 cents per ton ; average day's pay, \$1.25 to \$1.35.

Puddlers, catcher, 8 cents per ton ; average day's pay \$1.10 to \$1.25.

Puddlers, hookers (boys), average day's pay, 73 and 68 cents.

Puddlers, draggers, average day's pay, \$1.03.

Puddlers, lifters, average day's pay, \$1.10

Puddlers, weigher, average day's pay, \$1.15.

Puddlers, cinder weighers, average day's pay, \$1 and \$1.04.

18 train rollers, \$2.28 (less the following), average \$4 to \$6.

1 rougher, 23 cents per ton ; average day's pay, \$2.50 to \$2.75.

2 catchers, 22 and 15 cents per ton ; average day's pay \$1.75 to \$2.50.

2 hookers, 8 and 6 cents per ton ; average day's pay, 65 and 95 cents.

3 straighteners, 9 cents per ton; average day's pay, \$1.00 and \$1.10.

2 heaters, 55 cents per ton; average day's pay, \$2.75 to \$3.25.

2 heaters, helpers, 24 cents per ton; average day's pay \$1.35 to \$1.45.

9 train rollers, \$2.60 per ton (less the following), average day's pay, \$4.00 to \$5.00.

2 roughers, 29 cents per ton; average day's pay, \$1.50.

1 catcher boy, 17c. per ton; average day's pay, 90c.

2 straighteners, 11 1-2c. per ton; average day's pay, 65c.

1 Hooker boy, 10 1-2c. per ton; average day's pay, 60c.

1 Dragger boy, 10 1-2c. per ton; average day's pay, 60c.

1 Heater, 55c. per ton; average day's pay, \$2.50 to \$3.00.

1 Helper, 24c. per ton; average day's pay, \$1.30-\$1.40.

General laborers around the mill averaged \$1.00 to \$1.20 per day.

The mill work was mainly piece work and the working hours averaged 10-12 hours per shift.

The ore importations of the Steel Co. were continued, viz: 1700 tons of limonite from Brookfield, Colchester; 1135 tons of ore from Pictou County; 214 tons of ore from Pugwash, Cumberland County; and more considerable quantities of hematite, of which 62,637 tons is on record between 1891 and 1896, from Torbrook, Annapolis County. The Company mined very little ore and imported none from Torbrook in 1897; no ore was mined and the furnace was idle in 1898; and, in 1899, the property was disposed of to the Londonderry Iron and Mining Co. of Montreal, who as stated elsewhere, re-opened the Torbrook iron mine in 1903. The new company resumed smelting in 1904; following the policy of their predecessors they drew upon the Brookfield iron deposit for additional supplies of ore. The percentage of ores used at the furnaces in 1907 was:—

Brown .....	12.5 per cent.
Brookfield.....	12. "
Torbrook.....	53. "
Ankerite.....	22.5 "

The property was acquired by the Canada Iron Corporation in 1908. Works have been established by the Montreal Pipe Foundry Company near the furnace for the manufacture of pipes.

### \*OUTPUT AT LONDONDERRY MINES & IRON WORKS

Year.	Ore.	Pig Iron.	Bar Iron.	Year.	Ore.	Pig Iron.	Employed at Mines & Quarries.	Year.	Ore.	Pig Iron.	Employed at Mines & Quarries.
	Tons.	Tons.	Tons.		Tons.	Tons.			Tons.	Tons.	
1850				1873	2947	1046	.....	1896	22071	14892	.....
1851				4	2522	1462	.....	7	little	.....	.....
2				5		1909	300	8	.....	none	.....
3	4000	1000	.....	6	15274	little	159	9	.....	"	.....
4				7	18603	9863	89	1900	.....	"	.....
5				8	39702	.....	145	1	.....	"	.....
6				9	32333	.....	117	2	.....	"	.....
7				1880	55469	.....	166	3	49619	13585	184
8				1	40563	.....	139	4	.....	.....	.....
9	9000	4000	.....	2	43719	.....	206	5	58262	18614	199
1860				3	60082	.....	224	6	.....	.....	.....
1				4	60684	.....	216	7	15557	18836	125
2				5	50368	.....	197	8	9260	.....	.....
3			945	6	45335	.....	166		.....	.....	.....
4			911	7	43440	.....	160		.....	.....	.....
5			1198	8	41640	.....	164		.....	.....	.....
6			1633	9	41619	21289	188		.....	.....	.....
7	60000	26664	421	1890	40486	18382	195		.....	.....	.....
8			.....	1	46350	20840	203		.....	.....	.....
9			.....	2	37213	24750	145		.....	.....	.....
1870			.....	3	15217	21203	72		.....	.....	.....
1			.....	4	9214	10253	66		.....	.....	.....
2			.....	5	18532	15843	81		.....	.....	.....

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The extension of the Londonderry ore belt eastward of the mines near Totten's Brook, has been observed near "Debert Colliery" in altered slates and quartzite, containing limonite and spathic iron ores dipping S. 5° E. 40 degrees; on the Chiganois

\*Geo. Survey, Canada, A. D. 1904, states that these mines have yielded about 2,000,000 tons of ore besides carbonates. If so the Government reports from which these statistics are taken are incomplete. The latter do not state the production of pig iron A. D. 1873-1888, the operations during 1906, and other particulars.



River, in similar quartzite, containing spathic iron; and in small streams flowing from McKenzie's Settlement into North River. At Upper Kemptown, (at the eastern end of which lie ores usually somewhat similar to the Londonderry ores) trial pits have proved limonite and some specular hematite, for three miles westward of Monroe's.

*The Pictou Iron Field.*—In Pictou—the cradle of Nova Scotian railways and steam power, of modern Nova Scotian coal mining, and iron and steel making and of Nova Scotia Steel ship building, the Appalachian iron range known as the Torbrook-Annapolis hematite series reappears above the (Acadian) Appalachian Valley, as conveniently for industrial operations as the iron fields of Pennsylvania or Great Britain. In 1887-8 The Geological Survey of Canada, observing the metallurgical promise of Pictou, noted, that, limonite resembling similar Spanish ore imported to Great Britain, red hematite, specular, spathic and bog iron ores, lie in quantity and purity, within a radius of  $7\frac{1}{2}$  miles, at West River, Glengarry, Gairloch, Lorne Bridgeville, Blanchard, Sutherland and French Rivers.\* Ores of the "Londonderry" and Annapolis class—upon a combination of which, the present Nova Scotian iron industry was originally established—lie in favorable juxtaposition, exposed in hills and bluffs, workable to a considerable depth without expensive machinery, and contiguous to fuel, fluxes and tidewater. These metallurgical facilities, induced the founders of the present Nova Scotian steel industry (who did not own the best native iron deposits) to establish a blast furnace in Pictou; and, but for their subsequent purchase, for a nominal sum, of the "foreign" hematite of Conception Bay, Newfoundland—a point more convenient for the exportation of surplus productions, and later of the Sydney Mines, Cape Breton Colliery, Pictou, still their steel manufacturing, would yet be an iron smelting centre. The acquisition of this foreign ore has temporarily removed the main stimulus from the

\*This radius is apparently intended to be approximately restricted to the districts tributary to the East and Sutherland's Rivers, within which lie the principal known iron deposits, in which the mining operations referred to in this work have been centralized, and where the principal Pictou iron mines will be primarily opened.

development of the Pictou as from all other Nova Scotian ironfields. In A. D. 1902, the late Edwin Gilpin, Chief Inspector of Mines, estimated (1) that an area of 5 square miles, near the Railway, on the west branch of East River contained 3 beds of Brown hematite 1-3 feet thick (with surface indications of larger deposits) carrying say 57.71 Metallic Iron, .431 Phosphorus, .046 sulphur and 5.83 silica; (2) that an area of 5 square miles adjoining the railway, near Sunneybrae, East Branch of East River, contained specular ore, 3-12 ft. thick, and extensive indications of Brown hematite, the specular ore assaying about 64.41 Metallic Iron; 08 to none Phosphoric Acid .16 sulphur, and 3.20 to 3.68 silica; (3) that an area of one square mile at Springville, East Branch of East River, covers the Brown hematite, carrying probably 45-56 per cent. Metallic Iron, trace to .033 Phosphoric Acid and less than one tenth of one per cent. of sulphur, extending from Sunnybrae to Springville, apparently in pockets 3-15 ft. wide; (4) that an area of  $4\frac{1}{2}$  square miles, at Fall Brook, Sutherland's River, covers two deposits of red hematite 8-20 ft. wide, carrying probably 44-50 per cent. Metallic Iron, trace of sulphur, trace to 2 per cent., Phosphorus and up to 27 per cent. siliceous matter, traced across the area, apparently maintaining the above dimensions; (5) that a square mile at Sutherland's River, is said, by the late Sir William Dawson, to be traversed for about a mile by bedded red hematite 10 to 26 ft.\* thick, varying in iron contents from 43-55 per cent., and capable of being put on cars, for about 65 cents per ton; (6) that an area of 5 square miles, at Merigomish, French River, contains outcrops of several beds of (apparently) Carbonate ores, holding 30-48 per cent. Metallic ore, traced for about two miles; and that these properties, probably hold, within a moderate depth, 15,000,000 tons available ore, adjacent to rail, fuel and fluxes (with evidence of a larger tonnage)—capable of being put on cars. for from 60 cents to \$1.00 per ton.

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\*The average thickness of this ore is probably under 10 feet.

The East River limestones,—a belt of flux, sometimes carrying considerable percentages of Carbonate of iron, lying between the local coal and iron can, it is stated, be quarried and transported to a smelter at a comparatively low cost. The following are analyses of a limestone from Lime Brook, Springville:—

	I	2
Lime Carbonate.....	93.90	96.26
Magnesia Carbonate .....	2.45	2.33
Iron Peroxide .....	.59	.57
Manganese Peroxide.....	.56	.55
Alumina .....	.12	.10
Sulphur .....	.03	.02
Phosphoric Acid.....	.03	.03
Silica .....	2.10	1.99
Moisture.....	.18	.17

These results have been confirmed by analyses of all the most important exposures of limestone in the vicinity of the Pictou coal and iron fields by the late Dr. Edwin Gilpin, Chief Inspector of Mines.

\* \* \* \*

The proximity of this iron field to furnace fuels, fluxes, and rail, or tidewater routes to the markets of Eastern America is very favorable for iron and steel making; and the resemblance between its "Blanchard ore" and an ore opened about 30 miles further east in Antigonish, the course of the iron, the discovery of iron west of Kenzieville, and the extension of the Pictou Silurian series into the iron district of Antigonish indicate the trend of the bedded hematites of the Pictou field (not necessarily uninterruptedly) towards the Antigonish ironfield.

\* \* \* \*

The first ore mined in Pictou was a red hematite, discovered in A. D., 1828, on McLellan's Brook, by the Rev. Dr. McGregor, and favorably reported upon, by an English analyst, for the



General Mining Association. A blast furnace 40' high x 8' dia. at the boshes, erected at the Albion mines, was charged with a mixture of red hematite, mined near the Iron Ore Post Office and brown hematite from the Fraser Saddler farm, at Bridgeville, but great difficulty was experienced in making the metal flow; about 50 tons of iron produced proved hard and unsatisfactory. One analysis of the pig is stated to have been:—

Silicon .....	.409
Manganese .....	.504
Sulphur .....	1.238
Phosphorus .....	.788
Graphite Carbon .....	.668
Combined .....	1.295
Metallic Iron .....	95.098

Pieces lay about the yard for years, others were used as ballast at the Shipyard Point Slip; and, after the discovery of gold in Nova Scotia, A. D., 1860, some of the pig was manufactured into very superior stamp heads for a mill at Waverley. Some of the local clay ironstone, of which fully 41 beds underlie the "Main" seam, tested in a cupola, at the Albion Mines about the same time, yielded 35 per cent. of metal, so lively and fluid that delicate ornaments were cast from some, and No. 1 pig iron, freely susceptible to files and drills from the remainder. The furnace is said to have been ruined in A. D. 1829 by the carelessness of the furnacemen, and smelting was not resumed.

In A.D. 1872 the Nova Scotia Forge Co., Ltd., was established at New Glasgow to manufacture railway and marine forgings; and in 1882 the Nova Scotia Steel Company, Ltd., commenced the manufacture of steel from imported material by the Siemens Martin open hearth process, at the same point.

The relations between capital and labor at the Steel works about 1888 according to the State papers of Canada, were as follows:—

From the proprietors' standpoint:—

"Two hundred men employed, the number gradually increasing. Day and night work every alternate week, day hours being ten and night twelve, same pay for both. Rollers wages by the day \$4; by the tons as high as \$5 and \$6; average for the year about \$5. Heaters get \$2 per day; by the ton same as rollers; melters, \$2.50 a day; machinists, \$1.50 to \$2; blacksmiths, same; laborers, \$1.10, in winter \$1. Ten or twelve boys employed as helpers first. Pay twice a month, in cash and in full. A number of men own houses, a few hold stock in the company. No labor troubles or strikes. Would have objections to employing Union men. Has not asked if any belong to organization. On men leaving employ two weeks' notice expected. Wages have increased from \$1.30 to \$1.35 since 1884."

From the Melters' standpoint:—

"Earns from \$3.10 to \$3.25 a day. Has twenty-five men under him, one making \$2.25 a day, or 25 cents an hour; the others from 15 to 18 cents an hour; gas men, 12½ cents an hour; hours from 7 a.m. to 6 p.m. day work; night work till 7 in morning."

From a Foreman's standpoint:—

"Foreman in bolt-cutting department, and has from six to eighteen or twenty hands under him. Skilled men get from \$1.25 to \$2. Many men own houses. He owns three, built mostly out of earnings; two tenements of three or four rooms in each; each tenement brings \$3 or \$4 a month. Does not believe in labor organizations. Boys work same hours as men. Land costs about \$50 a lot and upwards, outside the corporation, about 50 yards from works."

From a Heater's standpoint:—

"Five heaters are employed; ten hours a day; constant employment. Gets \$12 a week, and wages compare favorably with other places. Is single, and pays for board \$3 to \$3.25, exclusive of washing. Is paid half-monthly, in cash in full. No society

fund, subscription being taken up for sickness or accident. No labor troubles. Some men have saved money. Habits of men not very generally sober. Day and night gangs take turns about."

At the Forge Co.'s Works.

From a Heater's standpoint:—

"Wages from \$2 to \$3.25 a day by the piece; fair average from \$2.25 to \$2.50, with constant work all the year round. Owns a house, purchased out of earnings, nearly."

From a Machinist's standpoint:—

Is a machinist, and works all the year round, at \$2.25 a day. A good machinist gets from \$1.75 to \$2.25. There is one boy learning the trade. Is married, and rents a four-roomed house, at \$5.50 a month. Does not think weekly pay would be more beneficial than fortnightly. Thinks monthly pay would be as good as any. Hours, ten a day.

The two companies were merged under the name of The Nova Scotia Steel & Forge Co., Ltd., in 1889; and two years later, the New Glasgow Iron, Coal & Railway Co., Ltd., (with which they were subsequently combined,) re-established the Pictou iron industry at Ferrona, on the Forks of the East River. Their furnace,—the parent of the now thriving Nova Scotian iron and steel industry,—was built 65 feet high, with three hot blast stoves of the three pass Massick & Crook type. The casting and \*engine houses, ore sheds, etc., were upon an adequate scale; and at the coal washing plant after the large coal was crushed, the whole was graded into various sizes, from dust to three-eighths of an inch, and washed down to 10 per cent. of ash and as low as 1.35 per centum of sulphur. These works were erected to treat limonite ores 5 feet thick and upwards, lying along the Silurian and Lower Carboniferous contact, on the East River; but hematite ores were imported for mixing, from Colchester, Annapolis, Antigonish, and ultimately from the Company's mines on Bell Isle, Conception Bay, Newfoundland. In 1895

\*54 Bernard Coke Ovens formed part of the plant.



the enterprise was amalgamated with "The Nova Scotia Steel & Forge Co.," whose daily capacity of 100 tons was worked up into bars, sheets and other forgings by 400 operatives, at a plant consisting of two Siemen's melting furnaces, each 20 ton capacity, three gas heating furnaces, five reverberatory heating furnaces, a 26 in. reversing cogging mill, with train of live rolls, heavy vertical hot billet shears with live rolls, a 20 in. plate mill, a 16 in. bar mill, a 12 in. bar mill, a 9 in. guide mill, ten pairs of shears, 40 tons and smaller, a 5 ton steam hammer, with 15 ton hydraulic crane, four smaller steam hammers and other appliances. In 1900 the company (which claimed to be the pioneer of Canadian steel making,) was further enlarged into "The Nova Scotia Steel & Coal Company, Limited," by the acquisition of the historic "Sydney Mines" colliery and its contiguous Cape Breton coal properties from the General Mining Association, of London, the pioneer of modern Canadian coalmining; and a coal washing \*plant, large batteries of coke ovens, blast furnaces and an open hearth steel plant were erected near the mine, to supercede the Ferrona establishment.

The New Glasgow works, from which the Steel Company's finished products are shipped, now (1908) employ about 800 persons, who annually earn about \$500,000. At these works the steel ingots made in the open hearth shops at "Sydney Mines" are reheated in two large continuous furnaces and cogged down on a compound condensing 26" reversing mill to the required sizes and shapes. The billets then pass to a 20" three high plate mill, a combined 18" and 9" mill and a 9" three high guide mill, where they are rolled into bars and plates. These mills roll plates up to fifty inches wide, and from twelve B. W. G. to three quarter inch thick; mine and tram rails from twelve to forty pounds to the yard; angles from seven-eighths by seven-eighths to 5 x 5 ins.; flat bars from three eighths ins. to twelve ins. †wide; fish plates, angle bars, tie plates and sundries for the manu-

\*One 200 ton per day Blast furnace (A. D. 1908).

†Round bars from five-sixteenths to four inches.

facturers of railway cars and agricultural implements; and a considerable proportion of their product is further manufactured at the works; where there are two automatic spike machines with a capacity of twenty-five tons of railway spikes per day, and appliances for the production of machinery steel and polished shafting. Marine machinery and iron or steel railway forgings up to fifteen tons weight are manufactured at the forge, principally from large flask ingots cast at "Sydney Mines"; and, at the car axle forges, as large a number of axles is said to have been manufactured per day per year, as in any other similar works in the Empire.

As the company does not utilize the native iron ores; its operations, through subsidized do not stimulate the development of the Nova Scotia iron fields.

The Fluxes used, procured from the Carboniferous Limestone series on Point Edward, about 17 miles from the Furnace, though variable probably averages 96.72% Carbonate of lime; 1.32% Carbonate of Magnesia and 1.44% silica; and the Newfoundland ore charged into the furnaces, stated to average 55.110 Metallic iron; 7.58 Silica; 1.01 Phosphorus and traces of Sulphur \*and Manganese, has averaged over 150,000 tons; 54.37 Metallic iron; Sulphur, 03, and .71 Phosphorus.

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Late in A. D., 1892 the Pictou Charcoal Iron Company, Limited, lit a furnace 50 ft. high by 11 ft., at Bridgeville, to smelt the East River brown hematites 10-18 ft. wide. Appliances for washing, roasting and screening the ore; "beehive" kilns for the manufacture of charcoal, two puddling furnaces, a steam hammer and an 18" roll train were added to the plant; but smelting was discontinued about 1895, after 28175 tons of ore had been mined, 5466 tons smelted and 2752 tons pig produced. The mines were, however, kept in operation and 23349 tons of ore† were sold presumably to the Ferrona smelter; the furnace being leased until 1899, to the "Minerals Products of New York &

\*Oxide of Manganese.

†Govt. statistics re this company's operations seem rather incomplete.

Hillsboro, N. B.,” for the manufacture of Ferro Manganese. About three thousand tons of limonite from a 200' shaft sunk by the Bridgeville Mining Co. were also sold to The Nova Scotia Steel Co., Ltd., in 1903, for \$3.00 per ton on a Metallic iron contents of 40%.

\*The Antigonish Iron Field.—The (Acadian) Appalachian iron field exposed between Bear River and Clementsport, at Nictaux, Torbrook, and in the highlands of Pictou, reappears in the highlands and contiguous maritime lowlands of Antigonish—trending towards Pictou. The bedded hematite on Ross and Arisaig Brook, though thin, where opened, is of a characteristically persistent type. Owing, perhaps, to the thickness of the glacial drifts, in places, little prospecting along its strike has been done, although ore could be cheaply mined in the district. The highlands (which are penetrated, principally towards the N. E. by intermittent, limitedly ore bearing igneous rock similar to that on the coast) hold apparently more important, bedded hematites, dipping north and south, in one instance visibly on an anticline or undulation which are stated to improve in regularity and quality on their westward strike. Of the Arisaig (Antigonish) iron ores, the Mines Department of Nova Scotia reported, (A. D., 1903,) of the beds, situated upon Upper Doctor's Brook, and its branches, about  $1\frac{1}{2}$  miles from Malignant Cove, that an officer of the Department, who examined their strike for about one mile, was told that their crops have been opened for a much longer distance each way, that the apparent general strike of the strata is about N.  $70^{\circ}$  E. the beds dipping (apparently northerly at a steep angle, and that of the six or seven opened along the face of Campbell's Bank. “No. 2”, exposed in several places, shows about 12' wide; No. 6, opened across its width, about 20' ore and stone, dipping about 40 degrees to the north on the surface. The Mines Department considers that a better idea can be formed of the ores from the openings on Iron Brook, about  $\frac{1}{2}$  mile west, where the following widths were supplied by a guide, said to be thoroughly acquainted with the ground:—

\*Conditions in this ironfield will markedly favor the cheap and convenient extraction of ore



1, said to be 16 feet wide	} *Stone Bands Alternate with the Ore
2, " 10-12 feet wide	
3, " 10 feet wide	
4, " 10 feet wide	
5, indistinctly seen ore	
6, said to be 5-6 feet wide	

The "Tunnel Vein" 6-7 ft. wide, worked west of the Iron Brook Pits about 14 years ago, by the Nova Scotia Steel Company, Ltd., in an open cut, a 50 feet shaft and by an adit in the hill is said to have been worked for about 1500 feet along its crop, and several thousand tons of ore, (perhaps not exclusively, however, from these workings) were shipped at Arisaig Pier. To date, eight million tons of ore are said to have been prospected in the Arisaig district in which surface impoverishments of the ore often develop at shallow depths into a full width iron ore body and samples from the four principal pits opened in connection with this estimate, are stated to have assayed 53; 53.88; 57.86 and 59.89 per cent. metallic iron, a trace of phosphorus and no sulphur.

\* \* \* \* \*

Veins of good specular ore 2'—4'6" thick have been opened (A. D. 1881) at Boyleston, near Milford Haven in the adjoining County of Guysboro; and about 255 tons have been shipped to the Londonderry iron works; but the cost of transportation to such distant smelters, proved too high for further development. In 1882 the Crane Iron Co., of Philadelphia, U. S. A., opened a similar deposit about 12 miles westward, near Erinville, Salmon River Lakes; and exported to the United States 3,000 tons of specular ore, worth about \$21,000 delivered. The company's workings extended from a 50' shaft, 25', through ore, to a wall; a second drift penetrated 60 ft. N. E. in ore, and a third 35 ft. S. E., also in hematite. Another band was proved for 12' S.E., and

\*The Federal (Ottawa) Mines Department has, more recently, examined this upland iron range and defined, within 10000 x 1000 feet, three separate iron beds, traced more than one mile and a quarter, the presumed workable thickness of which is "Tunnel" lead 5 ft. 0 in., "Intermediate" 4 ft. 0 in. and "Coarse" lead 10 ft. 0 in. The latter may improve with depth, surface, impoverishment frequently improving at a shallow depth in this field. The ore records of the Provincial Mines Department should be regarded merely as preliminary observations, indicative of general conditions in this field.

more or less ore was cut in openings about 100 yards  $232^{\circ}$  from the main shaft. The vein walls appear to be composed of greenish, dioritic, felspathic, trappean and brecciated rock, and, in the main workings, wedges and veins of ore have been encountered in diorite, but also brecciated with a cream white clay rock. The workings have been pumped out by the Dominion Iron & Steel Company, of Sydney, and 300 tons of ore have been mined, leaving a further, unascertained tonnage of ore in sight. The metallic contents is said to run from 55 to 62 per cent., phosphorus low and the sulphur variable from .034 to 1.62 per cent. Wedges and veins of specular ore have been found about a mile westward of the mine; eastward of it, towards the Boyleston mine, 6ft. of specular ore trending  $65^{\circ}$  in flinty quartzo-felspathic rock, holding large crystals of calcspar, has been mined, immediately east of Mink & Atwater Brooks.

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Cape Breton—On the contiguous island of Cape Breton, has been established by a combination of the Silurian ores of Conception Bay, Newfoundland with the local coking coals and fluxes the iron and steel industry of Canada.—The known Cape Breton iron deposits were summarized by the late Edwin Gilpin, Chief Inspector of Mines, in A. D., 1901, as follows:—

“At Big Pond, Ben Eoin, Red Island, Loran, Lake Ainslie, Mabou, Caignish, Lock Lomond and Grand Anse, red hematites are reported. Sometimes these deposits lie at the junction of Lower Carboniferous strata with older measures. In some cases openings have been made and samples of good quality have been extracted.

At George's River and Barrasois, on the Little Bras d'Or, in rocks of Lower Silurian and Cambrian age, are red hematites and magnetites, extending diagonally to Escasoni, on East Bay. The magnetites and hematites at Barrasois are reported to be in large quantity, but they have not been thoroughly tested as to quality. Red hematite occurs at Smith's Brook, and Gillis Lake Coxheath Hills district.

On Boularderie Island, at Long Point, spathic ore occurs several feet wide. East of St. Peter's are deposits of specular ore up to five feet thick, reported of fair quality. In the Mira district red hematites from 2 to 6 feet in thickness, have been opened at a number of points.

Westward from Whycocomagh, outcrops of red hematite and magnetite, have been traced for a limited distance only."

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There is reason to believe that it was proposed to locally smelt some of the Whycocomagh ore in A. D., 1871-73.

\*One hundred and forty tons were mined in 1872-3; and one of the deposits opened, apparently 10-12 feet thick, sometimes very pure, but usually mixed with quartz, was shafted 15' and stripped for 12 chains, apparently not, however, to its termination. Specimens examined at Ottawa, consisted of micaceous and magnetite ores, with a considerable portion of siliceous matter—one sample contained 41.28 metallic iron and another assayed 42.64 per cent. metallic iron, phosphoric acid, .26.

A tunnel driven about 1898, above the stream in the west bank of the brook flowing through the Indian Reserve, cut quartz and quartzite, about 7 ft. of hard red hematite and rock in layers of 2-4 inches thick, and, finally, 9 ft. of specular and hematite ore. occasionally mixed with fine grained magnetite. The 9' ore is stated to have averaged 50 per cent. metallic iron, about 5 10ths% phosphorus, 10-14% silica, and variable sulphur. The back of the vein, carrying the solid ore held little sulphur. This deposit may follow the course of the brook. The limestone on the crest of the Boisdale Hills, eastward of Whycocomagh, near the Bar-rachois Railway Station, carries a dense, and, in part, good grade magnetite, in which sulphur is said to increase to the N. E. Five hundred tons of hematite, averaging 44.43% metallic iron and silica 16.10 per cent., has been shipped to Sydney (1904) from a 10 ft. bed of ore, trending N. E., on the contact of the

\*Mr. Charles Robb (Geo. Survey of Canada Report 1873-4 p. 180) considered the geological horizon and mode of occurrence of this ore apparently analogous to the "Londonderry" Iron Range.



Carboniferous with older rocks, between St. Andrew's Channel and McLeod's Brook. The quality of this ore could doubtless have been improved by picking out the wall slate more carefully. Three or four hundred tons of high grade hematite have also been mined at the contact of the Carboniferous conglomerate with older rocks, in the same vicinity.\*

Thin bedded red hematites or magnetites, said to be 2-4 ft. thick, traced eastward from near the South Grand Mira Glebe House, nearly to Marion Bridge, (about six miles) are reported to analyse; near the Glebe House:—

Iron.....	63.49
Silica....	4.16
Phosphorus.....	0.161;

;and samples collected nearer Marion Bridge are stated to assay :

Iron.....	59.93
Silica..	6.18
Phosphorus.....	.329
Sulphur.....	.056

Hematite noticed at Big Ridge anticlinal, between the Glebe House and Marion Bridge is said to be apparently deposited under similar conditions to the hematites of Bell Island, Newfoundland. The surface deposits at the southern end of the Ridge seem to be liberally charged with iron which ochreously colors the soil and debris. As several synclines are developed in the Mira Valley, the bedded hematites of this district may cover an extensive area.

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The erection of extensive iron and steel works at Sydney, by The Dominion Iron & Steel Co., (an off shoot of The Dominion Coal Company,) and the transfer of the Pictou iron smelting industry to the opposite side of Sydney Harbor, to be contiguous

\*1276 tons iron ore mined in Barrasois district during 1908.

to private ore mines owned by both companies in Newfoundland, has been already noted.

As stated elsewhere (p. 248-9) the introduction of this foreign ore into the Nova Scotia iron industry has removed the main stimulus from Nova Scotian iron mining. The following table shows the consequent unsatisfactory progress of this important industry.

\*Iron ore mined in Nova Scotia, A. D., 1875—1908:

	Tons.
1875.....	4,467
6.....	15,274
7.....	18,603
8.....	39,702
9.....	29,889
1880.....	51,193
1.....	39,843
2.....	42,135
3.....	52,410
4.....	54,885
5.....	48,129
6.....	44,388
7.....	43,532
8.....	41,611
9.....	45,907
1890.....	51,191
1.....	57,311
2.....	75,000
3.....	66,839
4.....	83,512
5.....	79,636
†6.....	65,932
7.....	44,146

\*Ex. Nova Scotian Mines Reports and other records; former probably not invariably strictly accurate or complete.

†Newfoundland hematite introduced into Nova Scotia.

	Tons.
1898.....	31,050
* 9.....	16,169
1900.....	15,507
1.....	15,200
2.....	15,214
3.....	11,952
† 4.....	49,619
‡ 5.....	73,600
6.....	27,000
7.....	48,337
8.....	30,575

The dormancy of Nova Scotia iron mining illustrated by this table, to which the Author drew the attention of the Federal Commissioners sitting at Halifax, in A. D. 1906; vide "The Decline of §Iron Mining in N. S.," is undoubtedly due to the consumption of such considerable quantities of foreign iron ore (imported free of duty) at the Nova Scotian Blast furnaces. To this traffic in foreign ore, and not to lack of native ore, must therefore be attributed the tardy development of the ironfields of Nova Scotia, exactly as our valuable coalfields once lay partially undeveloped, owing to the similar importation of foreign coal.

The desirability of the development of the Nova Scotian ironfields cannot be overestimated. Iron mining, one of the chief labor providers and wealth distributors of the age, forms one of the bases of modern civilization, and the establishment of the Nova Scotian iron and steel industries, which are, in their economic aspects, preeminently National industries, upon Canadian iron ores is therefore so indispensable to sound national progress that fiscal arrangements to encourage Nova Scotian iron mining should be immediately adopted by the nation.

\*Iron and Steel Works erected at Sydney.

†Pictou iron smelting industry transferred to Cape Breton.

§Vide also the Author's plea for the encouragement of Nova Scotia Iron Mining, *Halifax Chronicle*; May 26, June 6 and 20, July 5 and 17, Aug. 8 and Sept. 20, 1905.

137,627 tons of this was Ankerite from the Londonderry Range.

NOTE.—For further information on the iron fields of Nova Scotia and the Chemistry of the ores, vide "Report On The Iron Ore Deposits of Nova Scotia," Department of Mines, Ottawa.



TABLE OF ANALYSES OF NOVA SCOTIA IRON ORES.

LOCALITY.	ORE.	Metallic Iron.	Phosphorus.	Sulphur.	Silica (Siliceous Matter).	Insoluble Matter.
<i>Annapolis County.</i>						
Torbrook .....	Magnetite .....	57·93	·16	·036	17·21	.....
" .....	" .....	59·11	·17	·09	14·97	.....
" .....	Hæmatite .....	59·86	None	·11	5·93	.....
" .....	" .....	60·00	·13	Trace	9·50	.....
Nictaux .....	" & Mag .....	50·09	·79	0·05	.....	18·94
Cleveland Ores .....	Magnetite .....	54·57	·23	0·08	.....	.....
Nictaux .....	Red Hæmatite .....	50·27	.....	.....	.....	18·13
Torbrook .....	" .....	52·44	1·66	.....	.....	11·00
" .....	" .....	60·72	·17	.....	.....	10·28
" .....	" .....	59·00	.....	.....	.....	†12·87
" Fine ore & rock .....	" .....	47·50	.....	·23	.....	26·50
" .....	" .....	55·74	·18	·08	.....	10·12
" Ore Best Lumps .....	.....	61·38	·18	.....	.....	.....
<i>Antigonish County.</i>						
Arisaig Pier .....	Hæmatite .....	52·34	·37	Trace	16·10	.....
*Arisaig .....	" .....	34·55	.....	.....	(19·40)	.....
" Near McInnis Brk. ....	" .....	48·77	·42	Nil	.....	‡22·56
" .....	.....	43·97	·50	.....	(14·40)	.....
" .....	.....	51·61	·39	·19	(9·40)	.....
" Doctor Brook .....	.....	46·62	·549	·493	(11·60)	.....
" Ross Mine .....	.....	32·81	.....	.....	(22·00)	.....
" Near Campbell's Bk .....	.....	44·75	·84	·008	.....	‡25·76
" Near Iron Brook .....	.....	45·30	·60	·003	.....	§26·83
<i>Cape Breton Island.</i>						
Whycocomagh .....	Magnetite .....	46·16	Trace	·51	24·34	.....
" .....	Hæmatite .....	56·00	Trace	·14	10·04	.....
" .....	" .....	57·20	·44	.....	14·80	.....
" .....	" .....	60·00	1·55	.....	6·00	.....
" .....	" .....	36·67	·66	.....	42·80	.....
" .....	" .....	60·90	Trace	·11	10·80	.....
" .....	" .....	48·25	Trace	Trace	24·78	.....
East Bay .....	" .....	57·92	·67	Trace	.....	12·80
" (French Vale) .....	" .....	59·53	·014	·075	(5·12)	.....
Loch Lomond .....	" .....	64·49	·033	·078	.....	7·77
George River .....	" .....	62·50	·09	Trace	7·82	.....
" .....	.....	49·18	.....	.....	(22·00)	.....

\*Reported samples from 4 Pits opened at Arisaig have assayed 53; 53·88; 57·86 and 59·89%.  
Metallic Iron, trace of phosphorus, sulphur, nil.

†Average of seven cars.

‡Average from 5 Trial Pits.

§Average from 4 Trial Pits.

§Average from 8 Trial Pits.

## TABLE OF ANALYSES OF NOVA SCOTIA IRON ORES.

LOCALITY.	ORE.	Metallic Iron.	Phosphorus.	Sulphur.	Silica (Siliceous Matter).	Insoluble Matter.
<i>Colchester County.</i>						
Brookfield .....	Hæmatite .....	44·18	.....	.....	.....	24·29
West Mine, average of pile .....	" .....	36·01	·46	·05	.....	25·00
Newton Mills .....	" .....	42·27	·018	·164	27·97	.....
Brookfield .....	Limonite .....	58·95	·023	.....	.....	.....
" .....	" .....	48·50	.....	.....	19·00	.....
Martin's Brook.....	" .....	58·30	13	·001	4·30	.....
" .....	" .....	57·85	·17	·008	4·79	.....
†West Mines .....	" .....	44·24	.....	.....	(15·35)	.....
Folly Mountains .....	" .....	58·68	Trace	·04	·52	.....
Cumberland Brook .....	" .....	57·25	·06	Trace	5·37	.....
" N. vein .....	" .....	58·27	37	·016	1·93	.....
" S. vein .....	" .....	55·77	·19	·004	3·05	.....
Cooks Brook.....	Specular ore .....	67·85	·003	None	.....	1·26
Londonderry .....	Ankerite (white). .....	11·20	.....	.....	(·50)	.....
" .....	" (yellow) .....	11·31	·035	.....	(·10)	.....
" .....	" (brown) .....	9·80	.....	.....	.....	.....
" .....	" .....	9·46	.....	.....	(·13)	.....
West Mines (14 samples). .....	Specular .....	59·10	.....	·54	.....	3·50
<i>Hants &amp; Guysborough Co.</i>						
Goshen (Hants).....	*Limonite .....	45·69	·035	.....	17·82	.....
" .....	*Limonite .....	50·79	·035	.....	19·59	.....
" .....	Ankte. & Limte. .....	35·10	·09	08	4·81	.....
Guysborough.....	Specular .....	58·51	.....	.....	(4·00)	.....
" .....	" .....	47·35	.....	.....	(30·50)	.....
" .....	" .....	39·48	.....	.....	(20·40)	.....
Salmon River, Guy's.....	" .....	45·11	·034	1·54	29·93	.....
<i>Pictou County.</i>						
†East River.....	Brown Hæmatite .....	49·22	.....	.....	.....	16·54
" Webster vein .....	Hæmatite .....	54·36	·10	·29	19·43	.....
" .....	" .....	43·40	.....	.....	25·68	.....
" .....	" .....	36·61	·08	·34	Undd	.....
" Blanchard .....	" .....	42·50	·26	·09	29·97	.....
" Fraser, Saddler .....	Limonite .....	59·50	Trace	·02	2·14	.....
" .....	" .....	62·24	·14	24	2·14	.....
" .....	" .....	65·20	.....	·002	4·80	.....
" .....	" .....	59·17	.....	.....	2·22	.....
" Cullen's, Drug B'k .....	" .....	57·71	·43	·04	5·84	.....

\*Resembles ore from Martin's Brook, Londonderry Range, N. S.

†Average of 22 samples.

‡Mines Report A. D. 1874 States: Silica 23·68.

†Average of 24 large samples.

TABLE OF ANALYSES OF NOVA SCOTIA IRON ORES.

LOCALITY.	ORE.	Metallic Iron.	Phosphorus.	Sulphur.	Silica (Siliceous Matter).	Insoluble Matter.
<i>Pictou County.</i>						
E. Riv., Cullen's, Drug B'k.	Limonite	56.83	.065	Traces	4.26	.....
" " "	"	33.83	.02	.48	25.13	.....
E. Riv., McDonald's Farm	"	51.63	.....	.....	(9.38)	.....
E. Riv., McDonald's Farm (washed ore)	"	58.41	.016	.....	(6.75)	.....
E. Riv., McDonald's Farm (clay washed from ore)	"	38.58	.....	.....	(28.67)	.....
E. Riv., McDonald's Farm	"	52.92	.019	.069	(8.18)	.....
East River, Grant Farm..	Hæmatite	56.57	.213	.096	(5.58)	.....
" " Black Rock ..	Limonite	41.70	.043	.....	(24.48)	.....
" " "	Washed ore	45.27	.045	.....	(19.78)	.....
" " "	"	43.81	.083	.....	(19.90)	.....
" " "	"	42.83	.08	.....	(23.40)	.....
" " "	Washed ore	49.84	.....	.....	(14.30)	.....
" " "	Lump ore	43.59	.....	.....	(18.30)	.....
" " "	Carbonate	35.34	.015	.13	(12.75)	.....
Sutherland River .....	Spathic ore	43.56	.013	None	3.76	.....
" " "	"	39.64	None	*.10	1.69	.....
East River .....	Specular ore	64.41	.04	.16	3.68	.....
" " "	"	67.18	Trace	2.61	(.84)	.....
" " "	Specular ore	65.60	Trace	.68	3.40	.....
Coal Measures .....	Black Band	28.00	.24	.21	16.55	.....
" " "	Clay Iron Stone.	35.00	Trace	.61	.78	.....
Merigomish .....	Bog Iron ore	46.56	.17	.21	12.32	.....
Grant Farm—Bridgeville.	Hæmatite	48.72	.081	†.36	(12.80)	.....
" " "	Brown Hæmatite	45.02	.12	.03	.....	12.80
" " "	"	53.41	.02	.04	.....	6.75
" " "	"	54.83	.03	.41	.....	8.58
Bridgeville—East River...	Hæmatite	44.76	.325	.....	(28.10)	.....
" " "	"	41.98	.348	.....	(27.34)	.....
" " "	Limonite	50.14	.048	.....	(13.90)	.....
" " "	"	51.41	.047	.....	(8.83)	.....
" " "	"	49.16	.048	.....	(14.25)	.....
" " "	Washed ore	46.39	.....	.....	(10.00)	.....
" " "	"	47.01	.....	.....	(9.50)	.....
" " "	Specular ore	55.64	.23	.....	(7.30)	.....
" " "	"	41.37	.....	.....	(11.40)	.....
Sunnybrae (Cameron) .....	"	44.82	.031	Trace	(17.89)	.....
East River .....	Limonite	35.15	.20	.91	(9.57)	.....
Lorne .....	Brown ore.	42.60	.161	.082	24.70	.....

\*Calcium Sulphate. †Sulphuric Acid.

NOTE.—These tables are for the most part, abbreviated from more extended Analyses published by the Geological Survey of Canada with Authorities and Notes on the Deposits, Vide Vol. 10. Some correction and additions have been made by the Author. For further Chemistry of Nova Scotian Ores. Vide recent reports by the Federal (Ottawa) Mines Department.



## \*THE COAL ROYALTIES OF NOVA SCOTIA.

The revenue derived from the "royalty" taxes levied by the Government of Nova Scotia, upon coal sold from collieries opened in the State Coalfields of Nova Scotia, between A. D. 1872 and 1908, set out in the following table, shows the annual contributions of the Nova Scotian Colliery Owners to the public services of the province during that period:

Year.	Royalty.	Year.	Royalty.
1872	\$ 59,155.38	1891	\$ 143,572.10
3	83,507.52	2	135,962.69
4	77,854.03	3	142,058.26
5	51,879.92	4	209,830.52
6	60,408.98	5	214,647.76
7	66,427.36	6	235,818.02
8	42,650.90	7	224,331.24
9	40,640.95	8	227,011.31
1880	40,068.61	9	274,648.42
1	73,674.62	1900	353,102.46
2	90,448.28	1	367,925.46
3	104,953.47	2	413,556.84
4	86,277.20	3	523,364.31
5	101,411.23	4	517,543.64
6	101,658.53	5	549,639.98
7	119,670.16	6	575,065.89
8	124,776.06	7	562,775.78
9	126,395.80	8	616,933.66
1890	129,646.79		
Total Royalties received by the Province upon }			
77,769,475 tons of coal..... }		\$7,869,294.13†	

\*Supplied by the Public Accounts Department of the Government of Nova Scotia.

†Of this sum, \$312,898 has been paid, since A. D. 1901, to the Nova Scotia ironmasters, as bonuses for the encouragement of the manufacture of iron and steel in Nova Scotia.

The above table should be read in connection with Chapter XIII, page 202, on the profits of coal mining in Nova Scotia.

## BIBLIOGRAPHY.

The compilation of a Bibliography of current literature upon the coal and iron resources of Nova Scotia has not been completed in time for publication in the first edition of this work ; and, owing to the widely scattered range of this literature, published during the past sixty years, it appears, at present impracticable to complete the proposed catalogue. The principal works on these important subjects are :

1. Acadian Geology Editions 1 to 4 by Sir William Dawson.
2. The Geology and Mineralogy of Nova Scotia, by Dr. Gesner.
3. The Mineralogy of Nova Scotia, by Prof. How.
4. The Coal Fields of Cape Breton, by Richard Brown.
5. The Coal Fields of Nova Scotia, by John Rutherford.\*
6. The Reports of The Geological Survey of Canada, Ottawa.
7. The Literature of The Mines Department, Halifax, N. S.
8. The Literature of The Mines Department, Ottawa, Ont.
9. The Iron Ores of Nova Scotia, Woodman, Mines Department, Ottawa.
10. The Transactions of The Mining Society of Nova Scotia, Halifax, N. S.
11. The Transactions of The Institute of Science, Halifax, N. S.

These works are accessible in The Science Library of the Government of Nova Scotia, Halifax, N. S. ; also, to a large extent, in the libraries of the principal, private and public scientific institutions, Geological Surveys, etc., in Canada, the United States and Great Britain ; and many of the official publications can be obtained on application to the Federal and Nova Scotian Governments.

The names of Sir William Dawson, Dr. Gesner, Richard Brown, Professor How, Dr. Honeyman, Dr. H. S. Poole ; and particularly of the late Ed. Gilpin, Jr., D. C. L., Fellow of the Royal Society of Canada, Companion Imperial Service Order, etc., etc., and the late Hugh Fletcher of the Canadian Geological †Survey, occupy a prominent place in the scientific literature of Canada, as the Authors of the most important researches into the resources of Nova Scotia ; and their work is justly regarded as the basis of the present extending public knowledge of the mines and minerals of the province.

\*Transactions North of England Institute of Mining Engineers, Newcastle on Tyne, England, May 7, 1870.

†The labors of Hugh Fletcher in the Geological Survey of Nova Scotia are about to be recognized by the erection of a Memorial Library of Mining Geology in the Provincial Science Library at the Technical College, Halifax, N. S.















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